



# Air Handling Units

***AeroMaster***

***Cirrus***

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### General Information

- AeroMaster Cirrus air-handling units are manufactured in accordance with valid Czech and European regulations and technical standards.
- AeroMaster Cirrus air-handling units must be installed and used only in accordance with this documentation.
- The manufacturer is not responsible for any damage resulting from use other than intended, and the customer bears the risks of such use.
- The installation and operating documentation must be available for the operating and servicing staff.  
It is advisable to store this documentation close to the installed air-handling unit.
- When handling, installing, wiring, commissioning, repairing or servicing the air-handling units, it is necessary to observe valid safety rules, standards and generally recognized technical rules. In particular, it is necessary to use personal protective work aids (e.g. gloves) because of sharp edges and corners when performing any handling, installing, dismantling, repairing or checking. All equipment connections must comply with the respective safety standards and regulations.
- Any changes or modifications to individual components of the AeroMaster Cirrus air-handling units which could affect its safety and proper functioning are forbidden.
- Before installing and using the air-handling units, it is necessary to familiarize yourself with and observe the directions and recommendations included in the following chapters.
- AeroMaster Cirrus air-handling units, including their individual parts, are not intended, due to their concept, for direct sale to end customers. Each installation must be performed in accordance with a professional project created by a qualified air-handling designer who is responsible for the proper selection and dimensioning of components concerning their suitability for a given application. The installation and commissioning may only be performed by an authorized company licensed in accordance with generally valid regulations.
- When disposing of components and materials, it is necessary to observe the respective environmental protection and waste disposal regulations. In case of final device liquidation, it is necessary to follow the policy of differential waste disposal. We recommend metal parts be scrapped and other parts be disposed of in accordance with separated waste regulations.
- **The latest version of this document is available on our website: [www.remak.eu](http://www.remak.eu)**

## Application, Operating Conditions and Construction

### Manufacturer's Notification

AeroMaster air-handling units are manufactured in accordance with valid Czech and European regulations and technical standards. AeroMaster air-handling units must be installed and used only in accordance with this documentation. The installation and operating documentation must be available for the operating and servicing staff, and it is advisable to store this documentation close to the installed air-handling unit.

### Application and Operating Conditions

- AeroMaster Cirrus air-handling units are designed for comfortable air-handling and air-conditioning in an air flow range corresponding to the air-handling unit's cross-section and required air flow velocity from 1.5-4 m/s at an air pressure difference of the fan of up to 2500 Pa. The air-handling unit is designed as a modular system with a frame and laminated construction which enables high flexibility. Thus individual modification to customer requirements is possible. Inner width (W), height (H) and length (L) are multiples of the module (N × 306 mm) and create space for the installation of built-in functional assemblies.

- AeroMaster Cirrus air-handling units are intended for installation on floors or substructures, and are delivered with a rigid base frame mounted in the factory.

- They are designed to transport air without solid, fibrous, sticky, aggressive or explosive impurities. The transported air must be free of corrosive chemicals or chemicals aggressive to zinc and steel, respectively aluminium.

- They are manufactured with the same construction for inside as well as outdoor environments, including units designed for rooms with greater requirements for cleanliness. Air-handling units intended for outside environments are completed with suitable accessories (roof, louvers, etc.) ensuring correct and failure-free operation. With these air-handling units, the correct selection, localization and connection of the M&C components, including anti-freeze protection, must be ensured.

- AeroMaster Cirrus air-handling units can be used in normal rooms (IEC 60364-5-51, resp. ČSN 332000-5-51 ed.2, ČSN 33 2000-1 ed.2) and in rooms with extended ambient temperature range from -30 °C to + 40 °C without additional measures - applies to the standard version. Custom-made units with decreased -40 °C to +40 °C or increased -30 °C +50 °C temperature range of transported air can be delivered.

- When designing the air-handling assembly, it is necessary to take into account the temperature and humidity of the inlet and outlet air in relation to the ambient temperature and humidity. It is especially necessary to analyze the relation of the unit's casing classification pursuant to EN 1886 and the risk of condensation, respectively ice build-up.

- The device can be used for outdoor installations if equipped with a protecting roof; the device is water spray proof (rain up to 60° vertical slant) while observing the Installation and Operating Instructions. The fans are equipped with motors insulated with F class insulation of the winding.

- The unit's noise level does not exceed max. allowed values as per Statutory Order No. 176/2008 Sb, Appendix No. 1, Article 1.7.4.2., Letter u).

### Air-Handling Unit Construction

- The air-handling unit is designed as a modular system with a frame and laminated construction. The walls consist of two layers of unified modular laminas attached to the frame. The first layer of the upper, lower and back walls has longitudinally-oriented laminas while the second layer laminas are cross-oriented. The front wall fitted with service panels has laminas oriented in the same direction in both layers. The service parts (panels) are also of laminated construction. Each panel consists of the external casing with integrated reinforcements.

The panels which are expected to enable occasional service access to the internal built-in assemblies are provided with locks and grab handles to make handling easier. The panels used for regular servicing (replacement of filter inserts, cleaning of built-in assemblies, etc) are provided with hinges and locks.

- All walls are of sandwich construction with a total insulation thickness of 50 mm. They are provided with a quality anti-corrosion surface finish. The connections between walls, panels and supporting cross-members are sealed with a seal with closed cell structure.

The seals used during the assembly of the air-handling unit's lamellar walls and casing have a closed cell structure. The non-glued replaceable sealing of the service panels is fitted in to the groove on the inner side of the panel.

- Internal casing: Standard version - galvanized sheet steel, optionally painted sheet steel (polyester paint) or stainless sheet steel

- External casing: Standard version - galvanized sheet steel, optionally painted sheet steel (polyester paint) or stainless sheet steel

- Frame profiles: Standard version - hot-dip galvanized sheet steel, optionally painted sheet steel (polyester paint)

- Insulation of the upper and side panels is made of 50 mm thick non-combustible mineral wool (Class A1 pursuant ČSN EN 13501-1).

- Insulation of the lower panels is made of 50 mm thick PUR foam boards (Class B2 pursuant DIN 4102).

- The joints are sealed with silicone compound.

### Air-Handling Unit Marking

The complete AeroMaster Cirrus air-handling unit is divided into "structural" BLOCKS, respectively transport-installation BLOCKS. Functionally, the block is defined by the internal built-in assembly (assemblies) which is (are) fitted into the block's casing, where the casing is created with laminated walls, supporting cross-members and a combination of service panels situated on the access side of the unit.

- The air-handling unit is then assembled from the transport-installation blocks at the installation site. At the outlet, the transport-installation blocks are fitted with an end panel or a frame to be connected to the next block.

- BLOCK is provided with a **BLOCK type (name) plate** indicating the following data:

- Manufacturer's name (incl. logo) and address
- Type, size and marking code of the BLOCK
- BLOCK serial number
- Order number (serial number)/year of production
- Weight

## Despatch

Each built-in assembly is marked with a type (name) plate situated on the service panel side. The name plate includes the technical parameters of the given built-in assembly. The user must ensure that every marking on the unit components will be readable and intact for the whole service life of the unit. If damaged, especially if safety is concerned, the marking must be repaired immediately.

### Information and safety labels

AeroMaster CIRRUS air-handling units, respectively individual sections, are also labelled with information labels indicating equipment operation, wiring diagrams, energy media inlets and outlets and logos of the manufacturer.



The "Other Danger" warning label situated on the face side of the service door indicates the hazard of catching by movable parts.

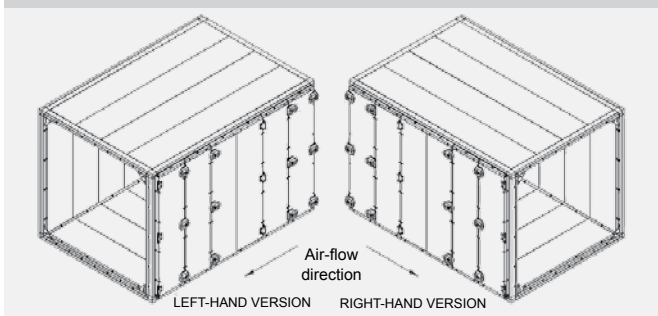


The service panels covering electrical equipment are labelled with a "Warning – Danger of Electric Shock" warning label.

### Side Variability of Unit Connections

Connection side is always determined by the air-flow direction:

Figure 1 – side variability of unit connections



### Delivery Contents

The following items are enclosed with every delivery of the air-handling unit:

- Accompanying technical documentation (Installation and Operating Instructions)
- Commercial and technical documentation, including air-handling unit assembly drawing
- Connecting material kit
- Installation kit
- Measuring & control components, respectively accessories in accordance with the bill of delivery

### Transport and Storage

- Air-handling units with a base frame of standard height (85mm) are dispatched on a pallet or transportation prisms.
- Air-handling units equipped with a raised base frame (with supporting legs) are dispatched without additional handling means.

### Packaging

As standard, the transport blocks of the Cirrus air-handling units are packed in PE foil and provided with cardboard and polystyrene protecting guards. The holes in the base frame can be used to lift the unit by a crane.

### Transport and Handling of Components

Air-handling units are transported to the installation site either as transport-installation blocks or disassembled (for transport and handling of disassembled units, refer to the separate manual).

Loading, unloading and handling can be performed by a fork-lift truck, a manipulating carriage or a crane. If lifted by crane, spacer bars must be inserted between the lifting wires to protect the air-handling unit from being damaged. If air-handling unit blocks without a base frame are handled, fork-lift truck forks of a sufficient length must be used to overreach the full depth of the lifted block. If the air-handling unit block with a base frame is handled, forks of a sufficient length must be used to overreach both side beams of the base frame.

Figure 2 – Handling options

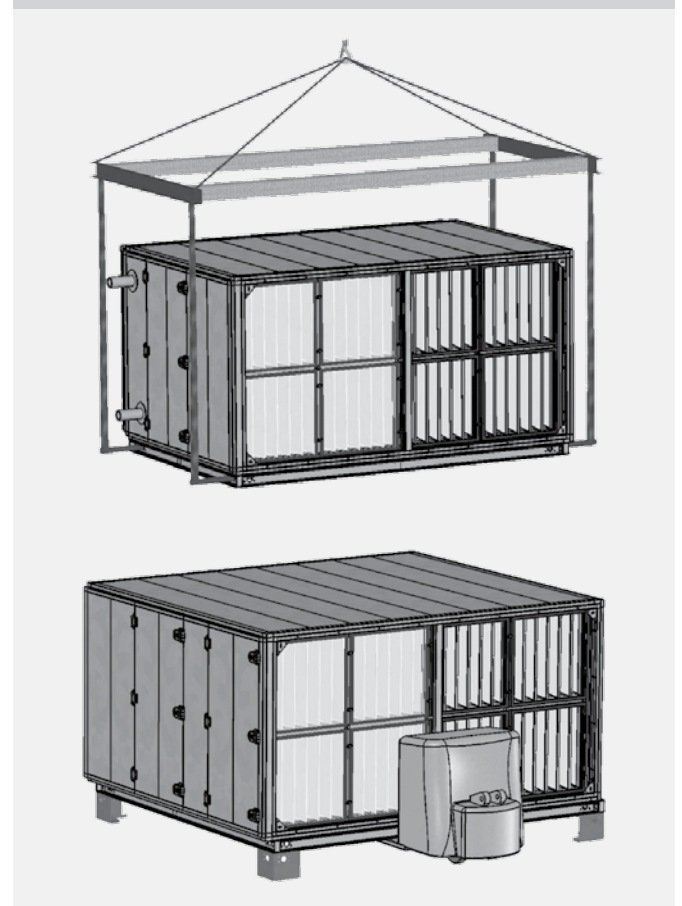
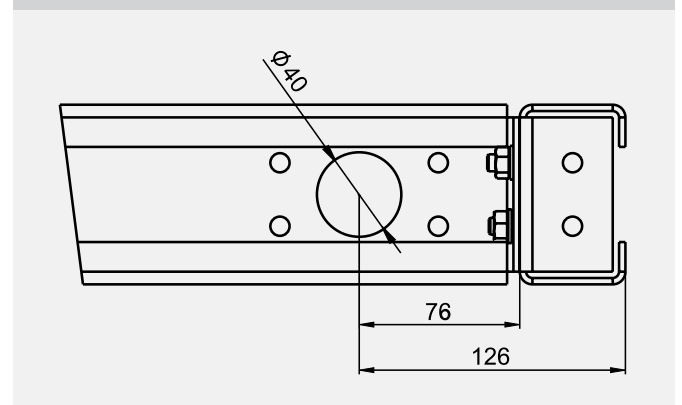


Figure 3 – Handling holes in base frame





## Installation

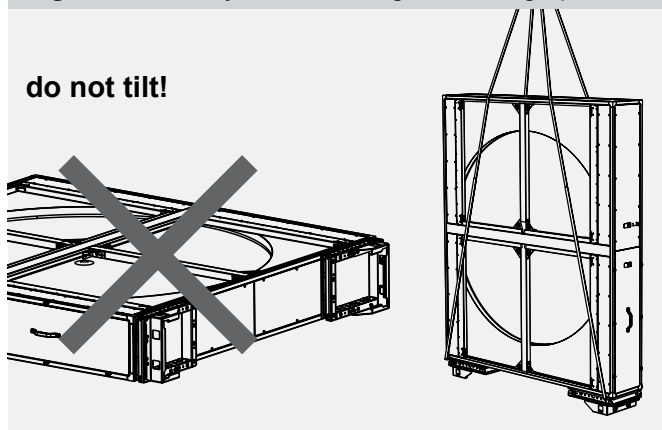
The air-handling unit blocks are packed in PE foil.

**Warning: When transporting, respectively handling the air-handling unit blocks, it is necessary to pay increased attention to those parts (pipes, closure valves, etc.) projecting from the walls of the air-handling unit block. All blocks may only be transported in the same position in which they are operated!**

### Rotary Heat Exchanger Handling

Increased attention must be paid to the safety of persons as well as of the product when handling the rotary heat exchanger block, which due to its dimensions (tall and narrow), weight and high centre of gravity is very unstable. The manufacturer recommends always fixing the rotary heat exchanger in position by suitable roping if it is not assembled in the block assembly! The rotary heat exchanger can only be stored, transported or handled in the vertical position. Any tilting may damage the rotor flatness.

**Figure 4 – Rotary heat exchanger handling options**



### Storage Conditions

As standard, the air-handling units are packed in PE foil. They must be stored in indoor rooms complying with the following conditions:

- Maximum relative air humidity must not exceed 85%.
- No moisture condensation.
- Ambient temperature must be in the range -20°C to +40°C.
- The air-handling units must be protected against penetration of dust and caustic vapours, or other chemical substances which could cause corrosion of the air-handling unit's structural components and equipment.
- The air-handling units must not be exposed to the direct effects of solar radiation.

AeroMaster Cirrus air-handling unit blocks may only be stored in the same position in which they are operated.

### Prior to installation, the following must be checked

- Delivery completeness
- Delivery integrity
- Volubility of rotary components (fans, dampers, rotary heat exchanger)
- Parameters of the power supply and connected energy media sources

Any found fault must be removed before starting the installation.

### Identification of Components

The association of blocks and built-in assemblies to the particular purchase order number is indicated on the name plate of each block and built-in assembly, i.e. device number. All blocks bearing the same device number create an air-handling unit. The manner of the blocks' assembly is apparent from the assembly drawing included in the accompanying technical documentation (respectively our offer) marked with the same order (device) number.

### Air-Handling Unit Location

The surface of the site for the air-handling unit installation must be level and flat. Maximum misalignment of the floor or supporting structure intended for the air-handling unit installation must not exceed 1 mm per 1 meter. Observance of this condition is important for installation as well as for the air-handling unit operation. The air-handling unit equipped with an integrated base frame does not need any special anchoring. It is advisable to ground the air-handling unit with grooved rubber stripes.

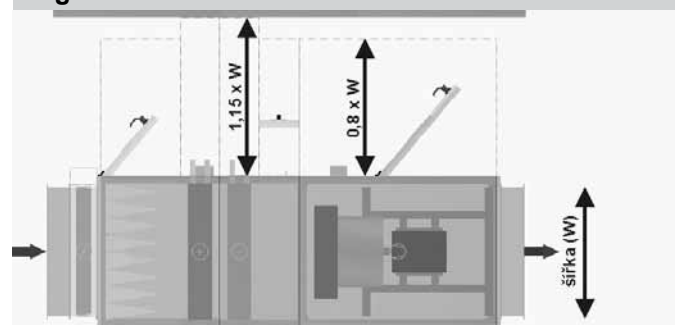
When installing the gas heater block, it is necessary to maintain safety distances from inflammable materials in accordance with national directives and standards of the state of installation (in the Czech Republic – ČSN 06 1008). No inflammable materials are allowed to be stored within the area of the gas heater block installation

**Warning: The base frame or base frame and foundation height should respect the condensate drainage siphon height if not resolved in another way (e.g. embedding into the floor or installation on an additional base frame of the required height).**

### Service Access

When planning the air-handling unit location, it is necessary to keep sufficient space for maintenance, service and operating. The need for this space depends on the air-handling unit configuration, i.e. on the operational blocks used.

**Figure 5 – service access**



Keep these distances from the wall to enable service and access:  
0.8 x width (W) of the air-handling unit: fan  
1.15 x width (W) of the air-handling unit: heater, cooler, drop eliminator, filter, plate heat exchanger and rotary heat exchanger.

Every service access can be visualized in the AeroCAD program.

Particular distances for the CIRRUS air-handling units:

- |                              |               |
|------------------------------|---------------|
| ■ Fan                        | 0,8 x width*  |
| ■ Heater, cooler, eliminator | 1,15 x width* |
| ■ Filter                     | 0,8 x width*  |
| ■ Plate heat exchanger       | 1.15 x width* |
| ■ Rotary heat exchanger      | 0,8 x width*  |

\* width of the built-in assembly

## Assembly of unit blocks

### Connection of Unit Blocks

The air-handling unit blocks can be assembled together by connecting their base frames and connecting the respective blocks.

### Connection of Base Frames

Connection of base frames using M8x20 bolts. The bolts and other connecting materials are included in the installation kit

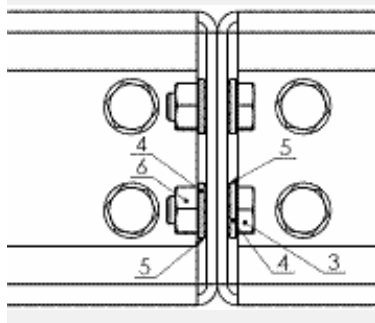
### Connection of Individual Blocks

Paste the rubber sealing (19 x 4) onto the contact surfaces of the connecting frame.

Push the connected blocks against each other and screw the blocks together in the corners of the connecting frame using M8 x 40 bolts (see figure).

If the stacked arrangement of the air-handling unit blocks is used, an additional connection will be necessary - using the upper block's base frame.

Figure 6 – connection detail



**Warning:** When connecting the transport and handling blocks of the air-handling unit, do not remove the rear laminated walls - they are an integral part of the casing structure!

Figure 9 – Internal connection of blocks

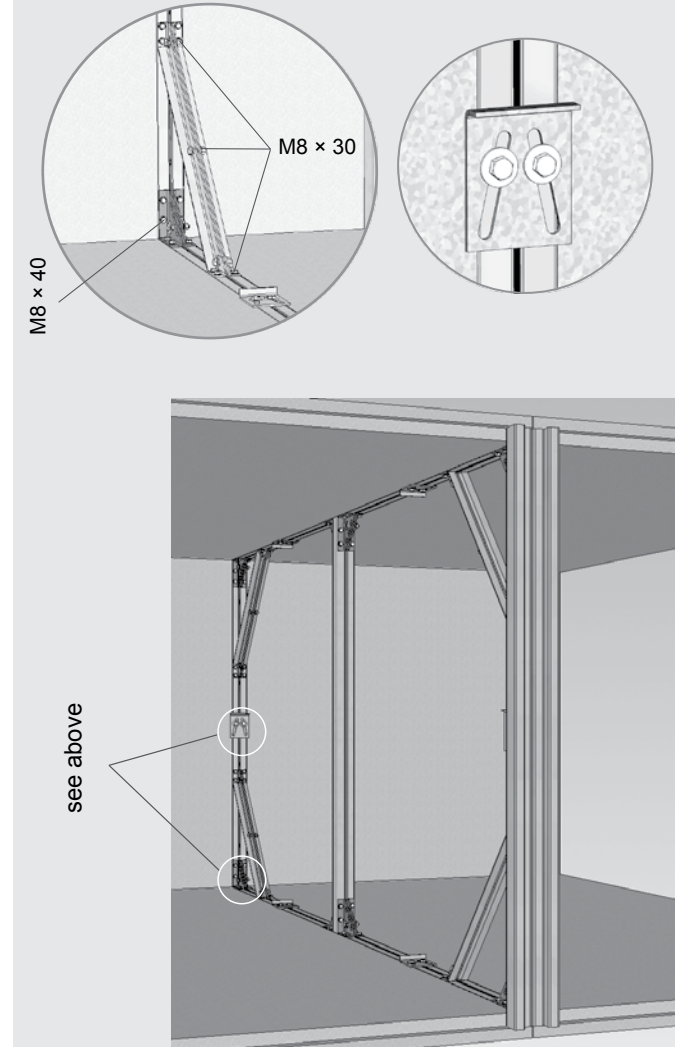
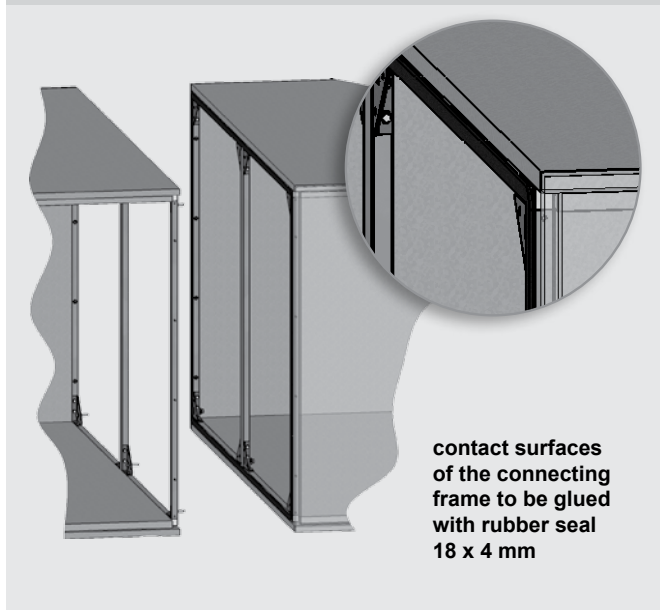


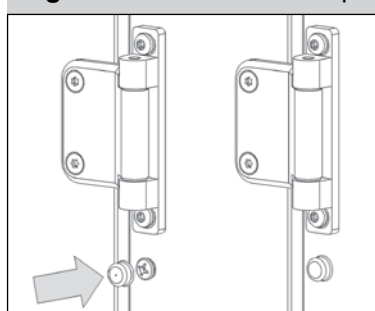
Figure 7 – Sealing between blocks



### Screw Head Caps

After the air-handling unit blocks have been connected, the screw head caps have to be fitted on all the panels on the air-handling unit service side.

Figure 8 – Screw Head Caps



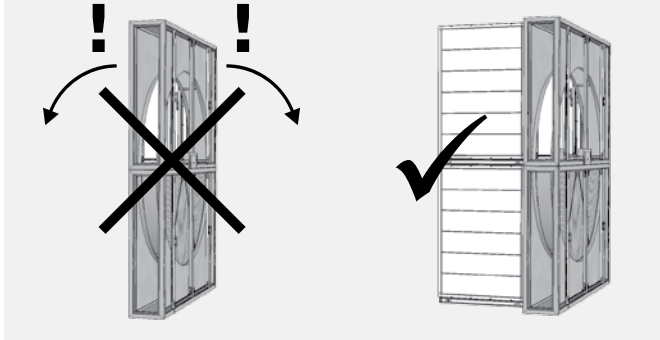
## Rotary Heat Exchanger Block Alignment

### Alignment procedure

#### Attention!

- Due to its dimensions, the rotary heat exchanger is very easy to roll over! Even the slightest impact or rocking can cause the exchanger to fall.
- Make sure the assembled heat exchanger is not left without being secured against fall.  
To secure the heat exchanger, use fastening straps or connect the adjacent chambers to the exchanger.

**Figure 10** – Exchanger securing and risk of falling



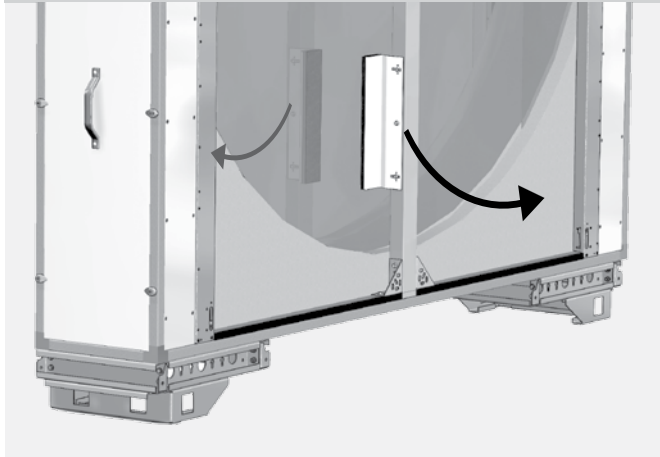
- The rotary heat exchanger can be transported using common transport means while the rotary heat exchanger must always be secured in the vertical position (i.e. the axis of rotation is in the horizontal position).

It is advisable to start with this (the heaviest) block when placing the assembly blocks in position. Immediately connect the rotary heat exchanger to the adjacent chamber to prevent it falling. Before connecting it to the adjacent chamber, place the seal on the connection frame (see figure # 7).

#### Warning:

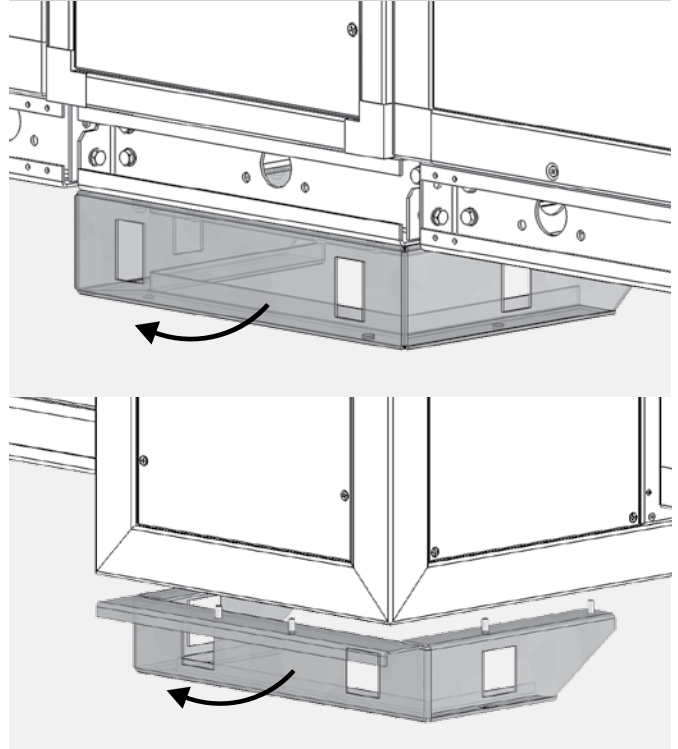
- The rotary heat exchanger is equipped with a transport brake which secures the rotor against free movement during transport and handling. This brake must be removed!

**Figure 11** – Transport brake removal



- Depending on the air-handling unit base frame height and heat exchanger size, the heat exchanger can be equipped with transport legs to make its handling easier.

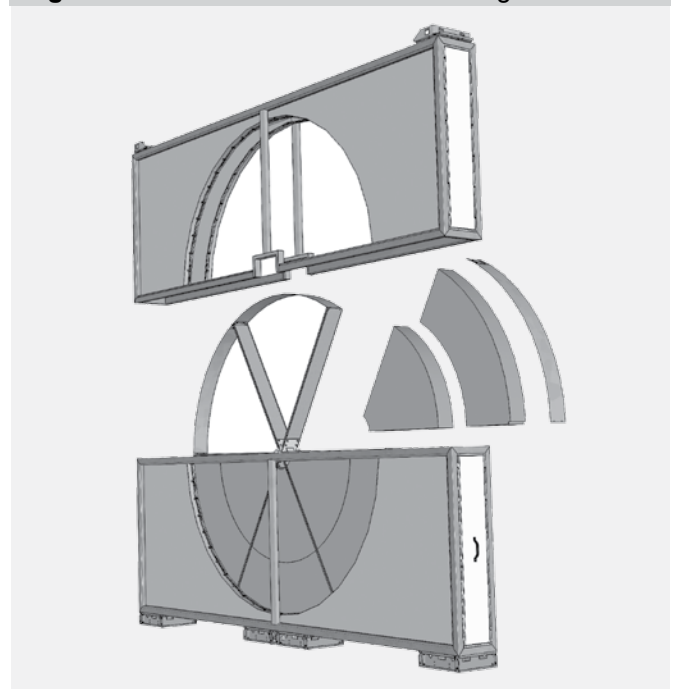
**Figure 12** – Transport legs



#### These legs must be removed before heat exchanger alignment!

- Larger heat exchangers are transported disassembled. The delivery includes separated lower and upper half of the frame and segments of the rotor. Installation and commissioning of the device can only be performed by a professional installation company trained or authorized to carry out this work by the manufacturer.

**Figure 13** – Disassembled Heat exchanger

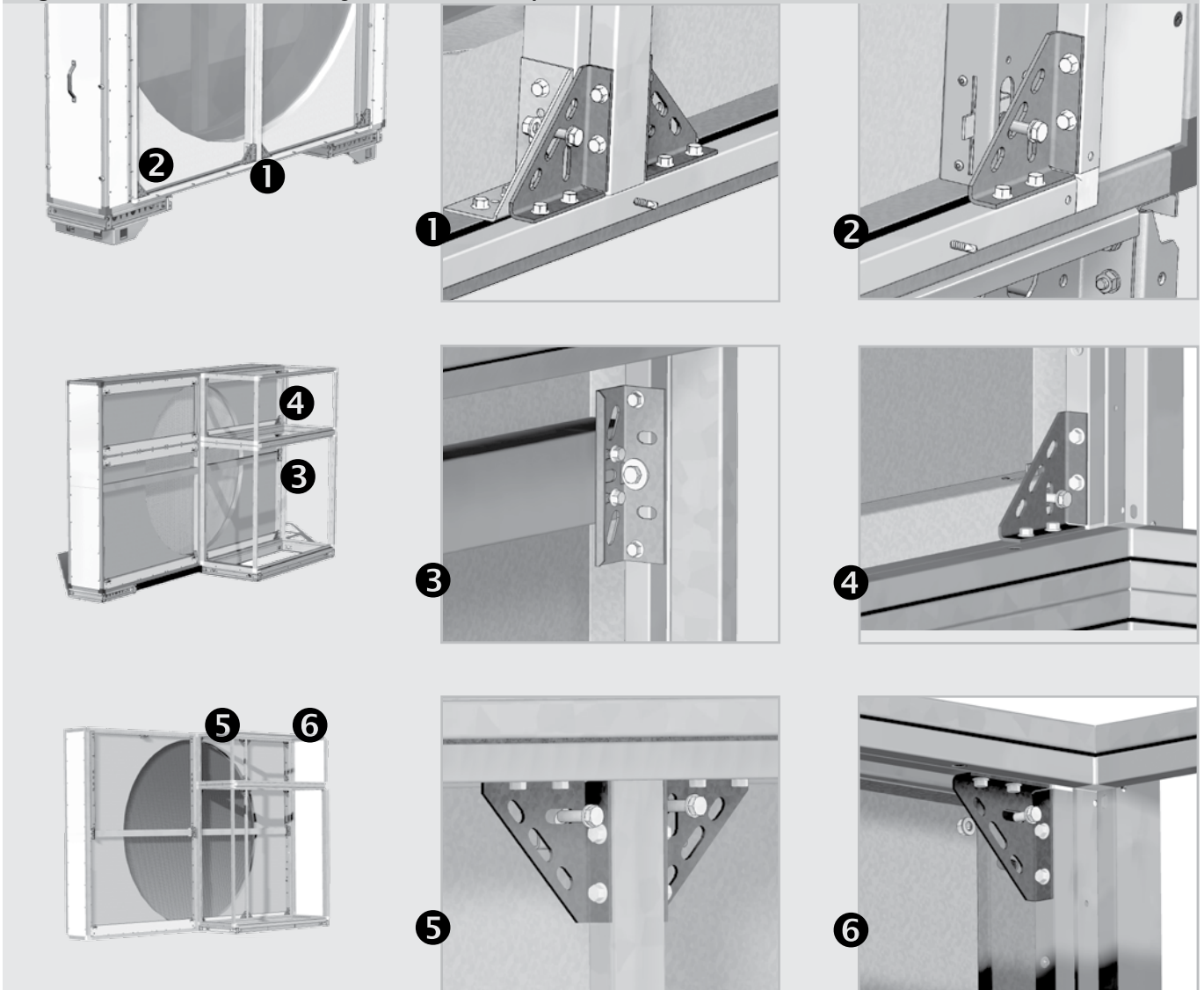


- Every rotary heat exchanger is fitted with "THIS SIDE UP!" and "FRAGILE" labels



## Rotary Heat Exchanger Block Alignment

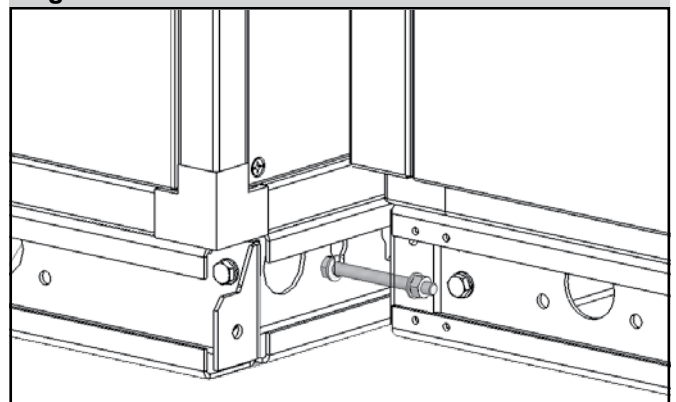
Figure 14 – of the heat exchanger to the assembly



**Warning:**

Poor and/or incorrect installation of the rotary heat exchanger block can result in costly repairs. It will result in rotor displacement, which will influence the tightness and service life of the assembly. Misalignment can be caused by improper handling during transport or failing to observe the conditions for correct installation. To check heat exchanger rotor fouling, it is necessary to perform regular monitoring of the heat exchanger rotor pressure loss. The heat exchanger rotor pressure loss must not exceed 15% of the pressure loss value measured on a new rotary heat exchanger. To enable regular servicing, maintenance, guarantee and post-guarantee service, it is necessary to provide a service access from both sides of the heat exchanger's rotor.

Figure 15 – Frame connection detail





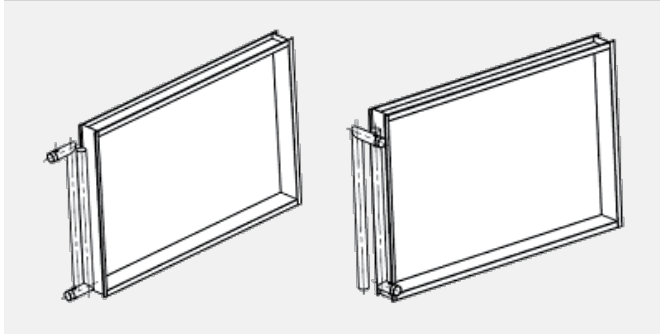
## Connection of Heat Exchangers

### Water and Glycol Heat Exchangers

The heat exchangers can be delivered in versions to be connected:

- a) through the fixed side panel of the air-handling unit
- b) into the inner cross-section:

**Figure 16 – Heating and cooling media feed**

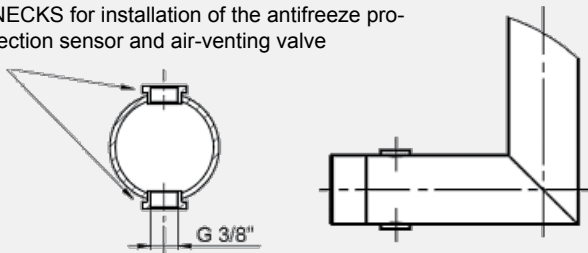


The corresponding connection points are marked with labels on the unit side panel (heating water inlet, heating water outlet, coolant inlet, coolant outlet). The connection diameter corresponds with the heat exchanger and given type parameters, and it is specified in the air-handling unit documentation. Available dimensions are from G1" to G3".

The headers are equipped with G3/8" necks for the air-venting valve in the upper part of the heat exchanger; these necks also enable an antifreeze protection sensor to be installed (on the exchanger outlet header) or the heat exchanger to be drained.

**Figure 17 – Anti-freeze protection sensor**

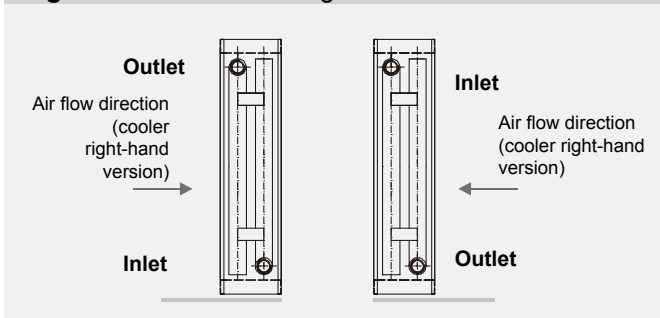
NECKS for installation of the antifreeze protection sensor and air-venting valve



### Connection of Water Heat Exchangers

The counter-current connection of the heat exchangers is necessary to achieve maximum output. When connecting the feeding fittings to the heat exchangers, use two wrenches to tighten the screws to avoid wresting of the exchanger's headers.

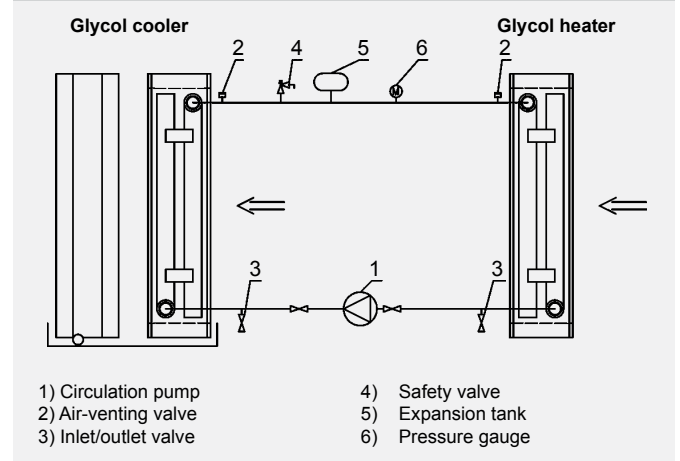
**Figure 18 – Heat exchanger connection**



After connecting the water heat exchangers (heaters and coolers, including mixing sets) to the distribution piping, it is necessary to pressurize (fill with water) and vent the entire circuit, including the heat exchanger, and then to perform leak-tightness checks of all pipe joints and of the exchanger itself (including inspection of the water exchanger block interior).

The manufacturer does not provide any guarantee covering any damage resulting from liquid leakage from leaky joints or damaged exchangers.

**Figure 19 – Glycol circuit connection**

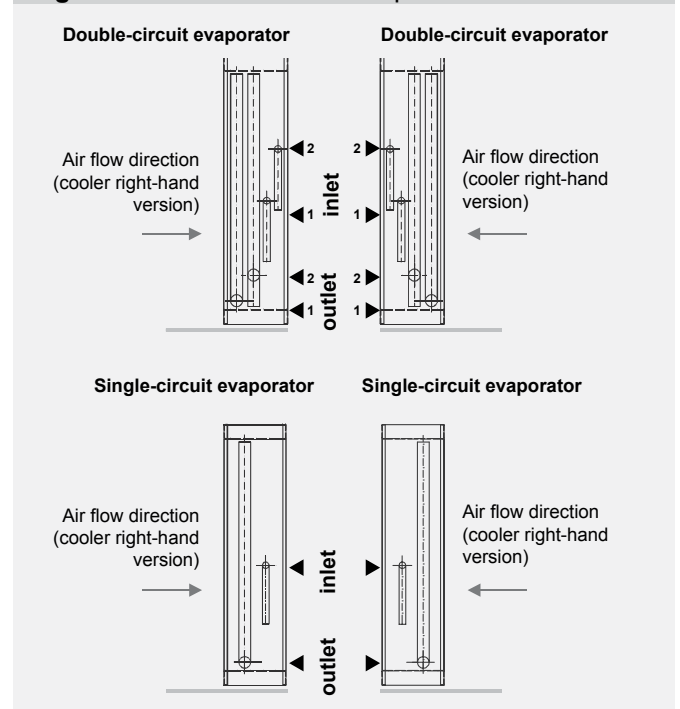


### Direct Evaporators

Direct evaporators must be connected by a specialized contractor authorized to install refrigerating equipment. The direct evaporators can be delivered in versions to be connected through the fixed side panel of the air-handling unit or into the inner cross-section.

The direct evaporators are filled with nitrogen in the factory. They can be delivered in single or multiple-circuit versions.

**Figure 20 – Connection of evaporators**



## Connection of Heat Exchangers

### Water Connected Air-handling Component Installation

Recommendations on water quality for heat exchangers that operate using low pressure hot water (LPHW) and chilled water:

- A good water quality – e.g. salt and lime-free drinking water – increases the lifetime and efficiency of the heat exchanger.
- Check the limiting values shown in the table annually to prevent damage to the hydraulic system and its components.
- If necessary inhibitors must be added.

*Note:*

*These limiting values are only basic information about the water quality and do not form any basis for a guarantee!*

Description	Symbol	Values	Effects in vent of deviation	
Hydrogen ion concentration	pH	7,5 - 9	< 7 > 9	Corrosion Fouling
Calcium and magnesium content	Hardness (Ca/Mg)	4 – 8,5 °D	> 8,5	Fouling
Chloride ions	Cl <sup>-</sup>	< 50 ppm		Corrosion
Carbon dioxide	Fe <sup>3+</sup>	< 0,5 ppm		Corrosion
Iron ions	Mg <sup>2+</sup>	< 0,05 ppm		Corrosion
Carbon dioxide	CO <sub>2</sub>	< 10 ppm		Corrosion
Hydrogen sulphate	H <sub>2</sub> S	< 50 ppb		Corrosion
Oxygen	O <sub>2</sub>	< 0,1 ppm		Corrosion
Chlorine	Cl <sub>2</sub>	< 0,5 ppm		Corrosion
Ammonia	NH <sub>3</sub>	< 0,5 ppm		Corrosion
Ratio of carbons/ sulphates	HCO <sub>3</sub> <sup>2-</sup> / SO <sub>4</sub> <sup>2-</sup>	>1	<1	Corrosion

1/1,78 °D = 1 °Fr, with 1°Fr = 10 g CaCO<sub>3</sub>/m<sup>3</sup>

ppm = parts per million (mg/l)

ppm = parts per billion (µg/l)

## Connection of Heat Exchangers, Duct, Wiring

### Steam Humidification

For a detailed description of installation, commissioning and prescribed inspections of the steam humidification built-in assembly, refer to the separate manual which is a part of the accompanying documentation of the AeroMaster Cirrus air-handling unit.

When installing the steam humidification assembly, observe the following recommendations:

- Air ducts leading through cold areas must be insulated to avoid condensation.
- The assembly must be situated in a non-freezing area.
- The steam generator can be noisy (switching of solenoid valves); therefore, it is advisable to install it away from quiet areas.
- 100°C hot and heavily mineralized water is drained from the steam humidifier.
- The following minimum distances (distances between the steam humidifier and the following air-handling unit components, where H represents the minimum evaporating distance calculated for the given conditions) must be observed to ensure proper operation of the steam humidifier and the entire AeroMaster Cirrus air-handling unit:
  - Humidistat piping, humidity sensor, temperature sensor: 5x H
  - Very fine filter: 2.5 x H
  - Heating elements, filter: 1.5 x H
  - Duct branch piece, duct elbow, air outlet, fan: 1x H

*Note: If the H value is not known, it is advisable to make the calculation with a minimum value of 1.0 m.*

### Condensate Drainage

Cooling, plate heat exchanger and steam humidification blocks are equipped with stainless condensate draining trays which terminate in an outlet for the condensate draining kit connection. The diameter of the neck for Cirrus air-handling units is 32 mm. The condensate draining kits are available as optional accessories. A separate condensate draining kit must be used for each individual block.

The siphon height depends on the total pressure of the fan, and ensures its proper functioning. The type of condensate draining kit must be designed in the course of the air-handling unit calculation. The condensate draining piping must end in free atmosphere, i.e. it must not end directly in the closed sewerage system.

Before operating the air-handling unit or after being out of operation for a longer period, it is necessary to fill the siphon with water. The air-handling unit can also be equipped with a siphon with a disconnecting trap and a ball valve (only negative pressure blocks). This type of siphon need not be filled with water before putting it into operation. If there is a risk of freezing, it is necessary to insulate the siphon and condensate draining piping, respectively keep the ambient temperature above freezing point, e.g. with an electric heating cable!

The gas heater block is provided with a condensate drainage outlet (1/2" pipe) to drain the condensate from the combustion chamber.

### Air-handling Duct Connection

The air ducting must be connected to the air-handling unit via an elastic element to avoid the transfer of vibrations and eliminate misalignment of the duct and inlet of the air-handling unit. The connection must be performed so that no loading from the air duct will be transferred to the inlet panel of the air-handling unit and no deformation of this panel will be possible.

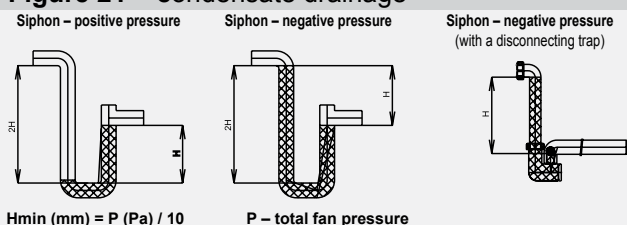
The accessories must be installed in accordance with the air-handling unit specification and the Installation Instructions of the manufacturers of such accessories.

No other structures must obstruct the unit inspection door opening, or unit operation and maintenance.

### Electrical Equipment Wiring

- Connection of the internal electrical equipment of the air-handling unit can be made via the wiring grommets which are situated on the service side of the air-handling unit casing (the service side according to the designer's specification).
  - All unused grommets must be blinded to maintain the degree of protection.
  - The wiring and installation of the measuring & control system elements must be performed by qualified professionals authorized to perform wiring of the given type of devices. The wiring must be performed in accordance with the directives and standards of the country of installation, and in accordance with the Installation and Operating Instructions of individual pieces of equipment (frequency converters, pressure and temperature sensors, etc).
  - Before putting the air-handling unit into operation, a wiring inspection must be performed.
  - Conformity of the power supply voltage, frequency and protection with the data on the type plate of the connected block and cross-section of the connecting cables must be checked before connecting the electrical equipment to the power supply.
  - The connecting cables must be long enough to allow free movement (e.g. when tightening the V-belts).
  - Properly fix all cables and keep minimum bending radii-uses.
  - If additional grommets are to be installed, avoid installation of grommets and cables close to the doors, access panels and connections of the air-handling unit's blocks.
  - The cables must never obstruct routine operation and servicing. Please respect the reserved servicing space.
  - Screw connections and grommets must not cause air leakage.

**Figure 21 – condensate drainage**



**Figure 22 – cable wiring grommet design**

The wiring grommet consists of a PG grommet, distance piece and sealing



## Wiring

### Wiring of Motors

To ensure correct operation of the air-handling unit, the motors must be connected so that they will rotate in the correct directions.

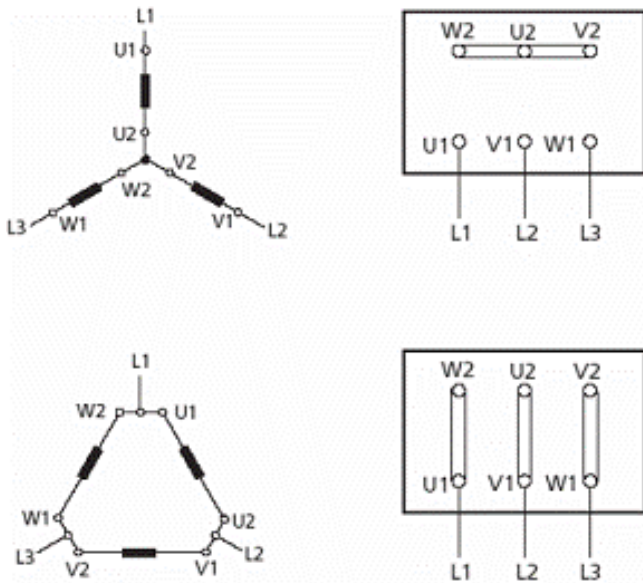
The motors are equipped with thermo-contacts which protect them against overheating. The thermo-contacts must be connected as shown in the wiring diagram.

The fan built-in assembly can be equipped with a service switch. The service switch is delivered as an optional accessory separately, not installed on the unit. The service switch connection must be performed in accordance with the directives and standards of the country of installation, and in accordance with the Installation and Operating Instructions.

The fan assemblies of some dimensional ranges (74, 84, 94) are equipped with two independent fans. The fan motors must be connected separately. 2 frequency inverters are delivered to control these fans.

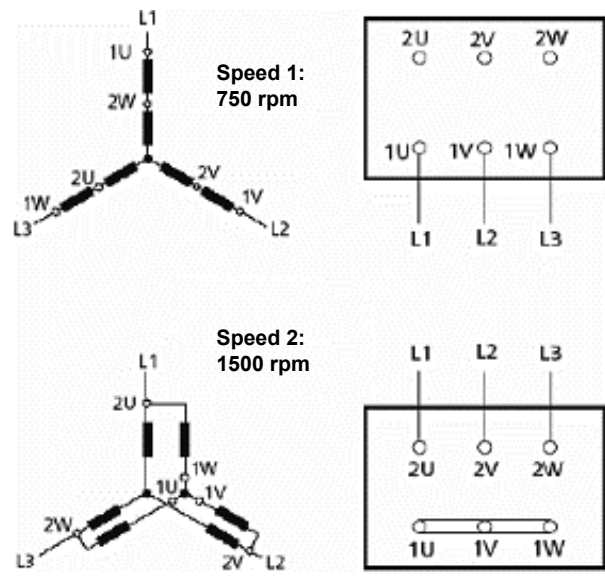
### Single-Speed Motors – Wiring Diagrams

- Rated voltage and wiring for motors up to 3 kW, including: 230 VD / 400 VY
- Rated voltage and wiring for motors above 3 kW: 400 VD / 690 VY



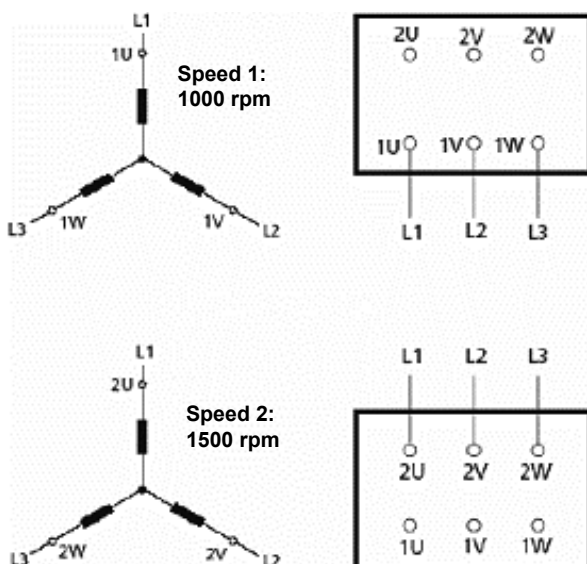
### Two-Speed Motors – Wiring Diagrams

- 8/4 pole motors –Dahlander D/YY (output, respectively speed ratio 1:2)



### Two-Speed Motors – Wiring Diagrams

- 6/4 pole motors – two separate windings Y/Y (output, respectively speed ratio 2:3)



### Electric Heaters

The electric heater connection must be performed following the instructions included in the enclosed documentation, the wiring diagram.

### Rotary Heat Exchangers

The rotary heat exchanger is equipped with a single-speed motor. The connection must be performed following the chapter Wiring of Motors (see above).

### Additional Electrical Equipment

Additional electrical equipment, which is not specified in this manual, must be connected in accordance with the applicable documentation, a wiring diagram, which is included in the equipment delivery.



## Commissioning

### Safety Measures

- The blocks with built-in assemblies which can generate certain injury hazards (electric shock, rotating parts, etc.) and connection points (heating water inlets/outlets, air flow direction, etc.) are always labelled with warning or information labels.
- It is forbidden to start the fans of the air-handling unit if the panels are open or removed, or without fixed protecting guard covers. The hazard of trapping by movable parts is indicated by a label situated on the service door of the air-handling unit. Service doors must always be closed during air-handling unit operation.
- Before starting any work on the fan block, the main switch must always be turned off and secured to avoid accidental starting of the motor during service work on the fan block.
- When emptying the heat exchanger, the water temperature must be below +60 °C. The connecting piping of the heater must be insulated so its surface temperature will not exceed +60 °C.
- It is forbidden to remove the service panel of the electric heater if energized.
- It is forbidden to operate the electric heater without the outlet air temperature control and without ensuring a steady flow of transported air.
- Controlled run-down of the fans must be ensured upon gas heater burner shutdown to avoid the exchanger overheating, and simultaneously, the outlet air temperature behind the gas heater, respectively the ambient temperature of the burner, must not exceed 40 °C.
- After being set by an expert, the parameters of the gas heater block must stay unchanged to maintain safe and trouble-free operation.

### Protection against Dangerous Contact with Non-Live Parts

The protection against dangerous contact of non-live parts is performed by design measures ensuring electrical conductivity: spot-welds, screw joints with fan washers, inter-connection with protective conductor (PE) in accordance with ČSN EN 60439-1.

### Inspection Prior to First Start-Up

The service panels are provided with hinges and external closures. The closure simultaneously serves as a handle. A special tool – a wrench - is needed to open/close the closure.

This wrench is delivered with each fan section and can also be delivered as a spare part (code Z03410058).

**Figure 23** – hinges and external closures



### General Routines and Checks

- Check alignment of the air-handling unit.
- Check whether all components of the air-handling unit are installed and connected to the air distributing ducting.
- Check whether all cooling and heating circuits are connected, and whether energy media are available.
- Check whether all electrical appliances are connected.
- Check whether all condensate drainage kits are connected.
- Check whether all M&C components are installed and connected

### Electrical Wiring

- Check the proper wiring of all individual electrical components of the air-handling unit according to the corresponding wiring diagrams

### Filter Built-in Assemblies

- Check the condition of the filters.
- Check the mounting of the filters.
- Check the settings of differential pressure sensors

### Water and Glycol Heater Built-in Assemblies

- Check the condition of the heat-exchange surface.
- Check the condition of the inlet and outlet piping.
- Check the condition of the mixing set.
- Check the condition, connection and installation of anti-freeze protection components

### Electric Heater Built-in Assembly

- Check the condition of the heating coils.
- Check the connection of the heating coils.
- Check the connection of the emergency and operating thermostats

### Water and Glycol Cooler and Direct Evaporators Built-in Assemblies

- Check the condition of the heat-exchange surface.
- Check the condition of the inlet and outlet piping.
- Check the connection of the condensate drainage.
- Check the connection and elements of the cooling circuit.
- Check the drop eliminator condition

### Plate Exchanger Block

- Check the condition of the exchanger vanes.
- Check the bypass damper functionality.
- Check the drop eliminator condition.
- Check the connection of the condensate drainage

### Gas Heater Block

- Check the connection of the condensate drainage.
- Check the wiring and functionality of the sensors and thermostats.
- Check the gas burner connection.
- Check the air-venting of the gas distribution system.
- Check the gas-flue connection.
- Check the bypass damper functionality

### Rotary Heat Exchanger Block

- Check the rotor and exchanger's frame alignment.
- Check the rotor for free rotation.
- Check the belt tension
- Check the sealing brushes for close fitting (a 1.0mm gap must remain between the rotor and sealing.)
- Check the motor for correct wiring.

## Commissioning, Service Regulations

### Fan Built-in Assembly

- Check the fan impeller for integrity and free rotation.
- Check the tightening of the Taper-Lock collets.
- Check the assembly screw connections for tightening.
- Check the protective covers for integrity and mounting.
- Check the fan impeller, inlet and outlet for cleanliness and foreign objects.

### Extra checks for fans with a belt drive:

- Check the belt tension.
- Check pulley alignment.
- Check the V belts for integrity

Until the air-handling system is adjusted, the air-handling unit can only be put into operation when the regulating damper in the air-handling unit inlet is closed. Operating the air-handling unit while the air-handling system is misadjusted can cause motor overloading and permanent damage. If the second stage of filtering is included in the air-handling unit, it is advisable to run the testing operation with the second stage filter inserts removed.

### Checks During First Start-Up

- Check the proper direction of the impeller rotation following the direction of the arrow on the impeller or fan casing.
- Check the proper direction of the rotary heat exchanger rotation following the direction of the arrow on the rotor (from the service panel side always upwards) and free rotation without dragging.
- Check the input current of connected equipment (it must not exceed the maximum permissible value stated on the rating plate).
- After 15 minutes of operation, stop the air-handling unit and check the temperature of the bearings and the tension of belts (belt-driven fans only). This check may only be performed if the fan is switched off!
- Check the water level in the condensate drainage kit siphon. If the water has been sucked off, it will be necessary to increase the height of the siphon.
- Check the mounting of the filters

During the testing operation, it is necessary to check the air-handling unit for unusual noises and excessive vibrations. The testing operation must last at least 30 minutes. After the test operation has finished, the air-handling unit must be inspected. Pay special attention to filters and check them for damage, as well as the fan block, check the belt tension, the tightening torques of threaded pins of Taper-Lock collets (refer to the Table of Taper-Lock collet tightening torques), and proper functioning of the condensate drainage kit. If the unit vibrates too much, it is necessary to again check the fan assembly and perform vibration intensity measuring, if necessary. If the vibration intensity of the fan assembly with an overhung impeller exceeds 2.8 mm/s, measured at the motor bearing shield on the impeller side, the fan must be checked and balanced by professional staff. During the testing operation, it is necessary to adjust (regulate) the entire air-handling system. Before putting the air-handling unit into permanent operation, it is recommended to replace or regenerate the filter inserts.

### Service Regulations

- Before putting the air-handling device into permanent operation, the supplier (installing company) in collaboration with the designer must issue service regulations in accordance with local legal regulations. We recommend including the following in these service regulations:
  - Air-handling device assembly description, its intended use and a description of its activities in all operating modes.
  - Description of all safety and protective elements and their functions.
  - Health protection principles, safety and operating rules to be observed when operating the air-handling equipment.
  - Requirements for operating staff qualifications and training, a nomenclature list of personnel authorized to operate the air-handling device.
  - Detailed emergency and accident instructions to be followed by the operating staff.
  - Operating particularities during different climatic conditions (e.g. summer or winter operation).
  - Inspection, checking and maintenance schedule, including a list of checking steps, and their recording.
  - Records of operating staff training, operation, inspections and cleaning of the rotary heat exchanger (subject to guarantee validity)

### Warning:

- **If work on the air-handling unit requires door opening, the air-handling unit must be disconnected from the power supply, and measures preventing accidental start of the unit must be taken.**
- **It is forbidden to operate the air-handling unit with open service doors or dismantled service panels**



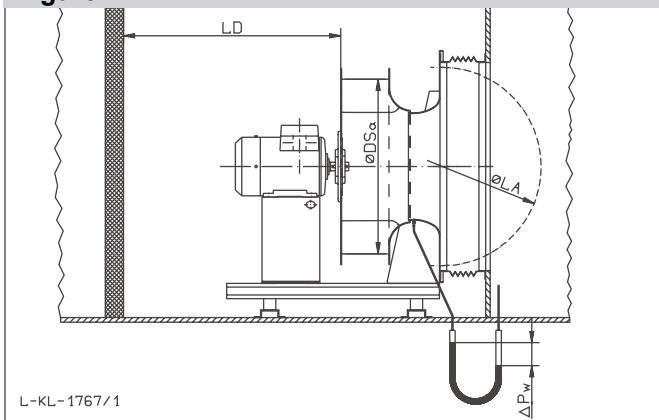
**The manufacturer prohibits stopping the exchanger wheel equipped with a layer of silica gel throughout the year.**

## Operating Checks

### Air Flow Rate Determination for Fans with Overhung Impeller

After the system has been installed and activated, it is possible to regulate the air flow through the unit equipped with a fan with overhung impeller using the simple method of measuring in the diffuser. This method eliminates to some extent errors in results determined by speed measurements in a wind tunnel, which are caused mainly by turbulent and non-linear air flow. For the diagram of the measurement determination of the difference in the static pressures in front of the inlet fan diffuser and in the fan diffuser, refer to figure 24. The air flow rate is related to the difference in static pressures in front of and in the fan with overhung impeller; refer to the measurement diagram.

**Figure 24**



The air flow rate (of the fan) can be determined by the calculation using the following formula:

$$\dot{V} = k \cdot \sqrt{\Delta p_w}$$

If the fan is operated at a temperature different from 20 °C, the air flow rate will then be calculated using the following formula:

$$\dot{V} = \sqrt{\frac{\rho_{20}}{\rho_{op}}} \cdot k_{20} \cdot \sqrt{\Delta p_w}$$

**Table 1**

Impeller	k-factor
RH 22 C	47
RH 25 C	60
RH 28 C	75
RH 31 C	95
RH 35 C	121
RH 40 C	154
RH 45 C	197
RH 50 C	262
RH 56 C	308
RH 63 C	381
RH 71 C	490
RH 80 C	620
RH 90 C	789
RH 10 C	999
RH 11 C	1233

qv = air flow rate  
k – factor of the fan (provided by the fan manufacturer)  
Δpw – static pressure difference (measured value)  
ρop – air density at the given temperature

Table of K factor values for RH-C (Ziehl-Abegg) fan with overhung impeller.

### Unit Operation Screening Checks

The operating staff's checking activities must be focused on the following:

- The air-handling unit operation and functioning, leak tightness of connections, inspection doors and service panels, temperature of energy media and transported air.
- The condition and operation of systems associated with the air-handling unit, whose proper functioning is needed for proper operation of the air-handling unit as well as for operation of the entire air-handling system.
- Wiring
- M & C system
- Water heater system – circuit, pump operation and water filters (also in SUMX)
- Cooling system
- Sanitary installation – condensate drainage
- Gas heater system

### Regular Inspections

The user will determine the intervals for regular inspections of the air-handling unit according to the operating conditions, however, at least once every three months. Within the framework of the inspection, check the following:

#### Overall Check

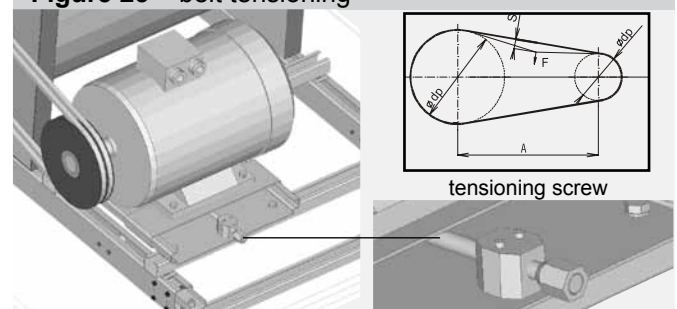
- Clean all parts of the air-handling unit

#### Fan Inspection

- Check the fan operation (strange noises and excessive vibrations of the unit) and, if needed, balance the fan, refer to the section Unit First Start Inspection.
- Check the impeller for cleanliness.
- Check the tightening of the hub threaded pins.
- Check the impeller for integrity and free rotation.
- Check the assembly screw connections for tightening.
- Check the silent blocks for condition (damage).
- Check the fan assembly elastic sleeves.
- Check the motor and fan bearings in the fan case.
- Check the fan belts for wear (if necessary, all fan belts must be replaced).
- Check the tension of the fan belts (if used)

Turn the tensioning screw to set the proper belt tension. Excessive belt tension can cause overheating of the bearings and damage or overloading of the fan motor.

**Figure 25 – belt tensioning**



## Operating Checks

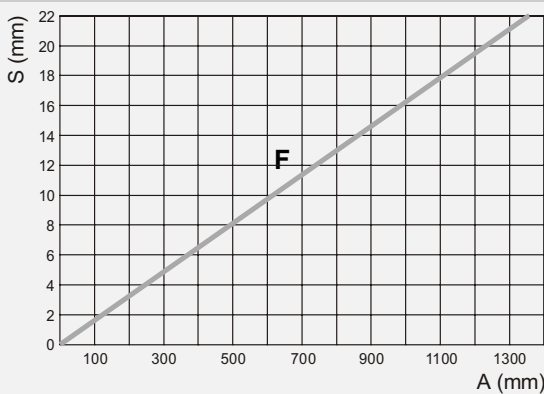
Too low a belt tension can cause belt slipping and premature wear. The following table indicates force "F" to measure the belt tension in relation to the smaller pulley type and diameter. The following chart shows the relationship between the belt slack "S" and the distance between the pulley axes "A".

**Table 2 – Belt tensioning forces**

Belt profile	Small pulley diameter	Recommended force to deflect the belt [N]*	
		min.	max.
SPA	80–140	20	27
	140–200	27	35
SPB	112–224	35	50
	236–315	50	65

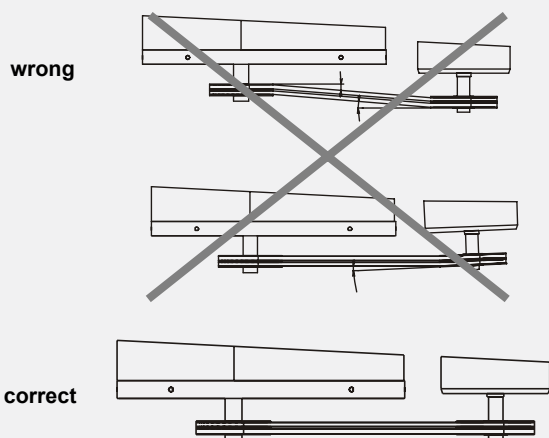
\*The force needed to deflect the belt to achieve 16 mm belt slack at a distance between pulley axes of A = 1000 m

**Chart 1 – Belt slack „S“ and pulley axes distance „A“ relation**



After replacing and tensioning the belts or pulleys, it is necessary to check the alignment of the pulleys (use a metal ruler).

**Figure 26 – Pulley alignment**



**Table 3 – Tightening torques for metric screws**

M4	M5	M6	M8	M10	M12
2,8 Nm	5,5 Nm	9,5 Nm	23 Nm	46 Nm	79 Nm

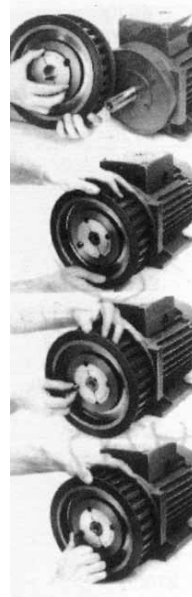
**Table 4 – Taper-Lock collet tightening torques**

1008	1108	1210	1610	1615	2012	2517	3020	3030	Taper-Lock	3525	3535	4030	4040	4535	4545	5040	5050
5,6	5,6	20	20	20	30	50	90	90	Tightening torque (Nm)	115	115	170	170	190	190	270	270

Taper Lock collets enable alignment of the pulleys.

**Figure 27 – Taper Lock® collet**

### Assembly



Before collet and pulley assembly, carefully clean the inner collet opening and taper surface.

Insert the collet into the pulley hub so that the threaded openings will check with the openings without thread.

Tighten the fixing screws by hand.

Carefully clean the shaft, and place the pulley in the required position. Tighten the fixing screws alternately with the prescribed tightening torque.

### Disassembly



Loosen the fixing screws, and insert one or two of them as force-off screws (according to the collet size) into the withdrawal openings. Knock slightly on the pulley. Keep tightening the force-off screws until the collet is released from the pulley.



## Maintenance and lubrication of ADH-RDH double-inlet fans equipped with a spiral fan casing and belt drive

All maintenance operations and lubrication must be performed using suitable tools and implements. First check the bearings by listening to them. If the bearings are in good condition they will generate a slight and constant noise while defective bearings will generate a loud and irregular noise. A low metallic noise, which is caused by the standard allowances between components, especially at low speed, is normal. Excessive vibrations and increased temperature of bearings indicate a possible defect. It is also necessary to check the mounting of the fan bearings in their casings for integrity and also for excessive lubricant leakage. Moderate leakage of lubricant, especially during fan commissioning, is normal and has no negative influence on fan operation. Estimated mechanical service life of bearings installed in the ADH/RDH Nicotra fans is 40000 hours providing the fans were selected considering their operating limits, the environment and planned drive size.



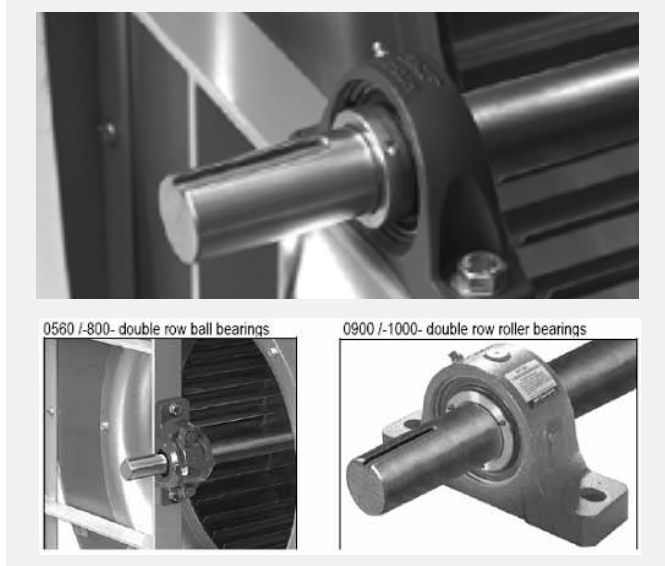
## Operating Checks

The service life of the bearing lubricant can be shorter than the service life of the bearings. Bearings mounted in rubber silent blocks or in casings without lubricating nipples are not intended to be additionally lubricated. Bearings equipped with lubricating nipples are used with fans intended for heavier duty operation and working conditions. Regular lubrication of the bearings is essential to reach the bearings' service life. Only bearings of ADH/RDH "K" and "K1, K2" fans need to be lubricated.

### Lubricating Bearings

There are many factors influencing the lubricating interval of fan bearings - bearing type and size, working speed, ambient temperature, diameters of pulleys, installed input, type of lubricant and working environment. Therefore, information based only on statistics can be provided. For normal operating conditions, it is recommended to lubricate the fan bearing at least once a year. If the operating temperature exceeds 50 °C, this time period must then be reduced by a half for each 15 °C above this threshold. For ADH/RDH K, K1 fans, it is necessary to refill the lubricant until it comes out.

**Figure 28 – Lubricant types**



For additional lubrication, we recommend for example the following lithium-type lubricants:

Manufacturer	Lubricant type
FINA	MARSON HTL 3
SHELL	ALVANIA FeH3
ESSO	BEACON 3
MOBIL	MOBILUX 3
SKF	LGMT2/S

**Table 5 – recommended amount of lubricant**

ADH/RDH	560	630	710-800	900-100
amount of lubricant	30g	30g	35g	15g

### Inspection of dampers

- Check the dampers for cleanliness.
- Check the damper flaps for free rotation.
- Check the damper flaps for full closing.

### Filter Inspection and Replacement

- Check the filters for condition and fouling (if fouled, the filter inserts must be replaced).
- The used filter inserts must be disposed of in an ecological way.
- Check the sealing for integrity.
- Check the mounting of filter walls and inserts.
- Check the settings of differential pressure sensors

**Table 6 – Recommended final pressure loss**

Filtration class/standard	EN13053:2006 E
G3, G4	150 Pa
M5, M6, F7	200 Pa
F8–F9	300 Pa

**Table 7 – Max. (designed) pressure loss**

Filtration class/Filter	Bag (CRVFAyy)	Compact (CRVFByy)	Frame (CRVFCyy)	Insert (CRVFDyy)	Metal (CRVFEyy)	Grease (CRVFFyy)
<b>G3, G4</b>	250 Pa		300 Pa	300 Pa	150 Pa	150 Pa
<b>M5</b>	400 Pa	-	300 Pa	-	-	-
<b>M6–F9</b>	400 Pa	450 Pa	-			
<b>Spare kit (code)</b>	CRNA0-yyxx	CRNB0-yyxx	CRNC0-yyxx	CRND0-yy03	CRNE0-yy03	CRNF0-yy03

xx ... filtration class, yy ... AeroMaster Cirrus unit size

## Operating Checks

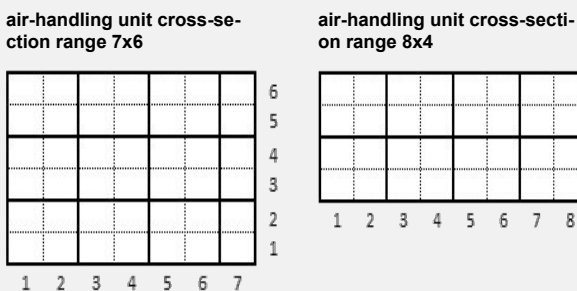
**Table 8 – Dimensions and numbers of filter inserts\***

Modules		A	E	Filter inserts – number	
Width	Height	Inner Width mm	Inner Height mm	592 x 592	287 x 592
6	4	1893	1227	6	-
7	4	2199		6	2
8	4	2505		8	-
9	4	2811		8	2
4	6	1281	1839	6	-
5	6	1587		6	3
6	6	1893		9	-
7	6	2199		9	3
8	6	2505		12	-
9	6	2811	12	3	
6	8	1893	2450	12	-
7	8	2199		12	4
8	8	2505		16	-
9	8	2811		16	4

Filter inserts sized 592x592 mm (supporting frame 610x610 mm) are used; with odd air-handling unit module widths, the half filter insert (supporting frame 305x610 mm) is added.

\*(The air-handling unit cross-section range is marked by modules – module 306 mm.)

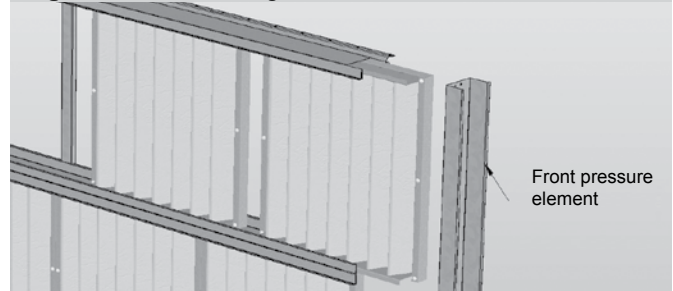
**Figure 29 – Filtering wall arrangement examples**



Different types of filter mounting are used depending on the filter type and filtration class. When replacing filter inserts, always check the condition of the sealing; if damaged, replace the sealing with a new one. When checking or replacing the filters, observe the following procedures:

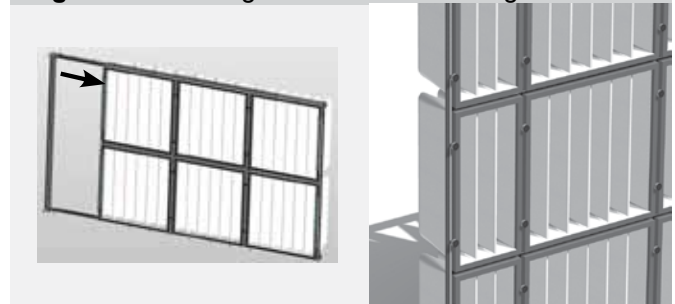
**1)** The frame and insert (G3) filter inserts are inserted into the guiding rails. The individual inserts are interconnected using the clips so all inserts can be removed together. Before the filtration walls can be removed, the front pressure element must be removed.

**Figure 30 – Mounting of insert and frame filters**



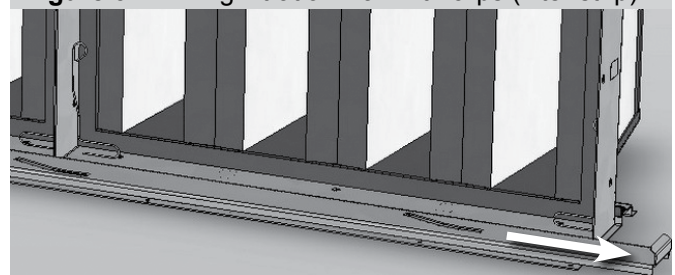
**2)** Bag, compact and metal filter inserts are fitted in separate fields of the filtering wall. The filters are replaced from the "dirty" (pressure) side. To change the filter insert, unscrew the locking closures and replace the insert with a new one. Before inserting the new filter inserts, check the sealing. Check the filter insert centring in the frame field before tightening the locking closures.

**Figure 31 – Sliding filtration wall handling**



**3)** In some cases, the filter inserts are fitted into the filtration walls created from mounting frames. The filters are fixed to these frames using the clips situated in the mounting frame corners.

**Figure 32 – fixing filtration wall with clips (filter strip)**

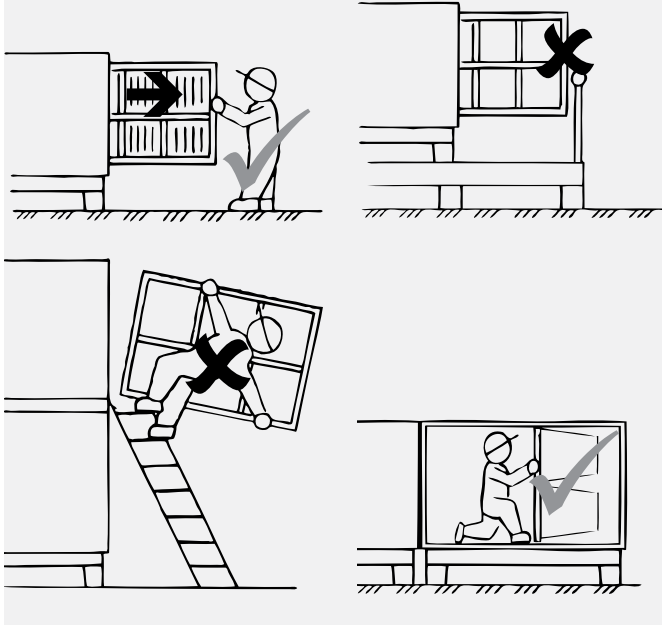


Depending on the space arrangement, the wall can be designed as a sliding or fixed (non-sliding) wall with access to inside the unit.

In some cases, the filtration wall can be designed as a sliding wall (the wall can be slid out towards the unit's service side). Special safety precautions must be applied when handling the filtration wall. We recommend the filtration wall to be pushed out from the unit in steps so that the accessible filter inserts can be gradually removed. New filter inserts are installed in the reversed order of steps. Due to its size and weight, never handle the filtration wall completely fitted with filter inserts outside the air handling unit. Replacement filter inserts can only be ordered as a complete kit. When placing an order, use the code from Table 7 and follow the instructions in the chapter Spare Parts.

## Operating Checks

**Figure 33 – Sliding filtration wall handling**



### Active Carbon Filter Cartridge Check

- There is no pressure loss change in the active carbon filter cartridge due to fouling.
- The most effective way to check the saturation of filter cartridges is by weighing them. After reaching their maximum capacity, i.e. their net weight has increased by about 20% to 50 % (depending on the type of carbon and filtered gas; ask the manufacturer for precise information), the carbon cartridge must be reactivated. If this limit is exceeded, the filtering efficiency will be diminished. The total weight of the clean standard, 450 mm long, active carbon filter cartridge is 2,500 g, the weight of the filling is 2,000 g (max. recommended increase in weight is 400 to 1,000 g).
- The carbon cartridge is reactivated as a whole. It is advisable to possess a spare set of filter cartridges.
- Subsequent intervals of cartridge replacement can be scheduled on the basis of the above-mentioned checking measurements.

### Checking the Exchangers (Heaters, Coolers)

- Clean the dirty heat exchange surfaces using a vacuum cleaner or hot-water cleaning machine.
- Be very careful when cleaning the exchanger's vanes to avoid mechanical damage.
- It is important to check the air-venting of the exchangers.
- Permanently check the functionality of the condensate draining system (coolers).

**Important: If taking the exchanger out of operation during the winter season, the water must be completely drained from the exchanger, and possible water residuals must be removed, e.g. by blowing out the exchanger with pressurised air; or the exchanger must be filled with a safe antifreeze solution of water and glycol.**

- Water residuals can freeze in the exchanger and damage the copper pipes.

### Steam Generator Check

- All prescribed checks are included in the Installation Instructions attached to the steam generator. Please follow these instructions, Especially in the first hours of operation: Check the water conductivity (min. 5 refills per water exchange cycle, sparking and max. current checking); check the cylinders for condition (water leakage) and operation; check the tightening of electrical connections.
- Every three months of operation: Check the steam generator operation (number of water refilling switchings per cycle) and the condition of the cylinders (water leakage, condition of electrodes and inner casing of the cylinder).
- Yearly or every 2500 service hours: Replace the boiling cylinders; check the condition and shape of hoses; check the sealing of the distributing tubes inside the chamber; check the tightening of electrical connections

**Warning: Electrical equipment! The steam generator cylinder can be hot. In case of water leakage, the hazard of burning and/or electric shock exists! The intervals of inspections and service life of parts can vary depending on the water quality and operating conditions.**

### Checking the Electric Heater

- Check the heating coils for fouling; vacuum the heating coils if necessary.
- Check the functionality of the safety thermostats

### Rotary Heat Exchanger Inspection

Rotary heat exchanger condition inspections must be performed regularly; checking the rotor for cleanliness is the most important part of these inspections. The user will determine the intervals for regular inspections according to the operating conditions, however, at least once every 3 months. At the same time, the user must perform the following checks:

- Check the functionality.
- Check the rotor for cleanliness.
- Check the sealing brushes for tightness.
- Check the rotor condition and tension of the driving belt.
- Check fouling of filters; inlet and outlet.
- Connection tightness

If fouled or damaged, the filters must be replaced with new ones immediately. If any fouling of the rotor is found, the user must ensure its expert cleaning. The rotary heat exchanger rotor can be cleaned by pressurized air, steam or pressurized water. Failure to perform maintenance can result in permanent damage to the rotary heat exchanger rotor and very expensive repairs.

With divided rotors, the manufacturer recommends the rotor perimeter casing be slightly tightened, including adjustment of the sealing elements, after 80 operating hours (the tightening must be performed all along the perimeter of the rotary heat exchanger so that it will not cause ovality of the rotor).

## Spare Parts and Service

### Plate Heat Exchanger Inspection

- Check the plate heat exchanger for fouling.
- Check the functionality of the condensate drainage.
- Check the bypass and mixing damper flaps for free rotation.
- Check the damper flaps for full closing

### Gas Heater Block Check

The gas heater inspection must be carried out once a year, including burner adjustment and flue gas measurement!

### Verification Measurements

After completing the regular inspection of the air-handling unit, it is necessary to verify and record its actual performance parameters.

### Overall check

#### Clean all parts of the air-handling unit:

- Min. 1x per year or more frequently, if needed (recommended cleaning solution – 10 parts of a dish washing cleaner, 45 parts of Isopropanol, 45 parts of water – pH 5–9, do not use cleaners containing active chlorine). Max. 50°C when steam cleaning equipment is used.
- When high-pressure cleaning equipment is used, there is a risk of paint damage, especially in the elbows
- Don't use brushes or similar abrasive tools and cleaners
- First, probe on a little surface area
- Use the same technique on the entire surface area to prevent differences in colour in some areas

### Spare Parts and Service

Spare parts are not included in the air-handling unit delivery. If any spare parts are needed, they can be ordered from REMAK a.s. or the regional distributor. In your order, specify the unit serial or purchase order number, and the parts needed.

### Spare Filter Inserts

A complete set of filter inserts can be ordered. Specification of the filter type (bag, compact, insert, or grease/metal filter), XP air-handling unit size and filtration class will do. There is no need to specify the types of individual filter inserts of the filter.

### Active Carbon Cartridges

The active carbon cartridges are designed for a specific composition of filtered gases. The carbon cartridge is re-activated as a whole. Active carbon which contains toxic substances, radioactive impurities or PCB cannot be re-activated!

### Service

Guarantee and regular servicing can be ordered from REMAK a.s. or the regional distributor. The manufacturer can authorize trained service providers to perform this service; their list can be found at [www.remak.eu](http://www.remak.eu)

### Disposal and Recycling

When using or disposing of the air-handling unit, it is necessary to observe the respective national environmental protection and waste disposal regulations. In case of final unit liquidation, it is necessary to follow the policy of sorted waste disposal; this means to respect differences in materials and their composition.

It is necessary to hire a provider specialized in sorted waste disposal in accordance with applicable local standards and regulations.

Active carbon which contains toxic substances, radioactive impurities or PCB must be disposed of in accordance with applicable legal regulations.

After exceeding its service life limit, the unit belongs to waste group Q14 according to the Waste Act (č.185/2001 Sb.).

### Waste Classification

(in accordance with Directive No. 381/2001 Sb.)

- 15 01 01 cardboard box (paper and cardboard packaging)
- 15 01 02 polyester packaging pads (plastic packaging).
- 15 01 03 pallet (wooden packaging)

### Disabled device and its parts:

- 16 02 06 metal and aluminium parts insulating material (other items from disabled devices)
- 15 02 03 filtering materials
- 16 02 15 electrical parts (dangerous items from disabled devices)



## Installation of Covering Roof



When installing this, it is necessary to observe valid safety rules, standards and generally recognized technical rules.

All parts and connecting material needed for the installation are included in the air-handling unit delivery. Check the delivery completeness and intactness before starting the installation. Any found fault must be removed before starting the installation. The roof can only be installed once the air-handling unit has been aligned. There is no need for special tools to install the roof.

*Warning: The roof must not be used as a catwalk. The roof must not be loaded with the weight of any components.*

### Stand-alone units or vertically arranged units

The roof system respects the air-handling unit's "lamellar" concept. The roof slope is created by bending it over the central roof girder.

### Installation of Carrying Elements, Mouldings and Gutters

- Longitudinal parts are delivered in unified lengths of 1 m / 2 m / 3 m. Before installation, these parts must be cut to the required length using sheet-iron shears or a circular saw.
- First, install the roof girders using 6.3 x 19 mm self-tapping screws.
- Install the Frame covers and gutters using 6.5 x 19 mm roofing screws with rubber washers.

Figure 1

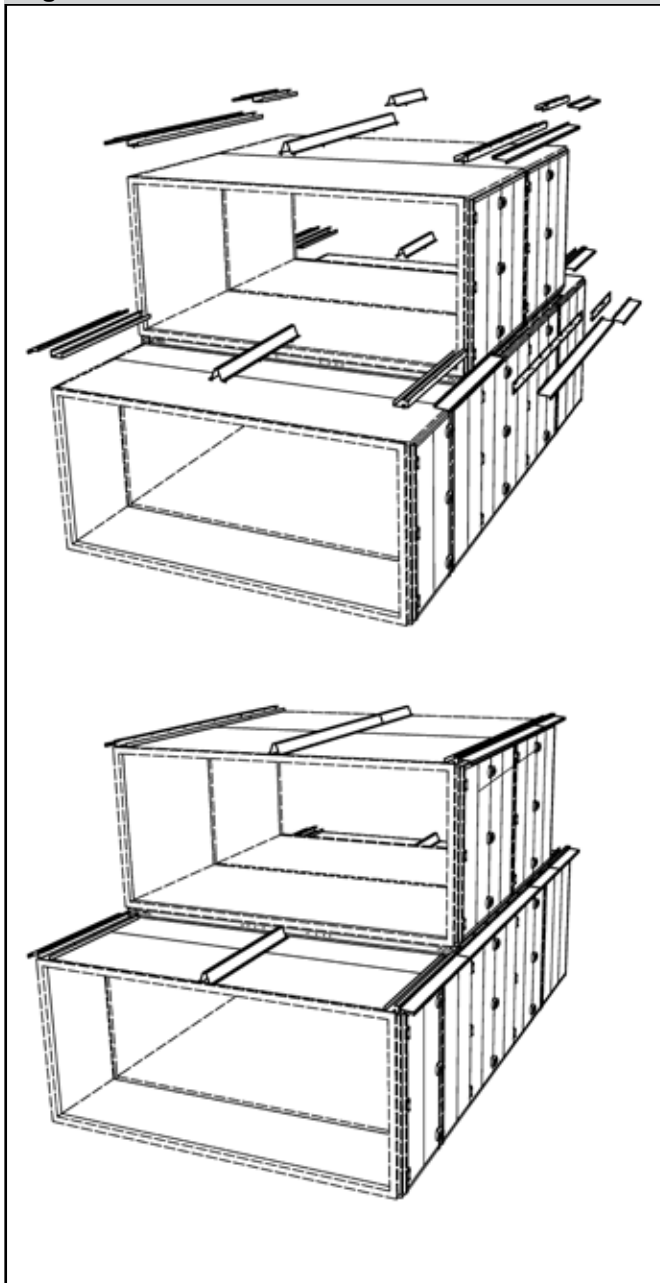


Figure 2

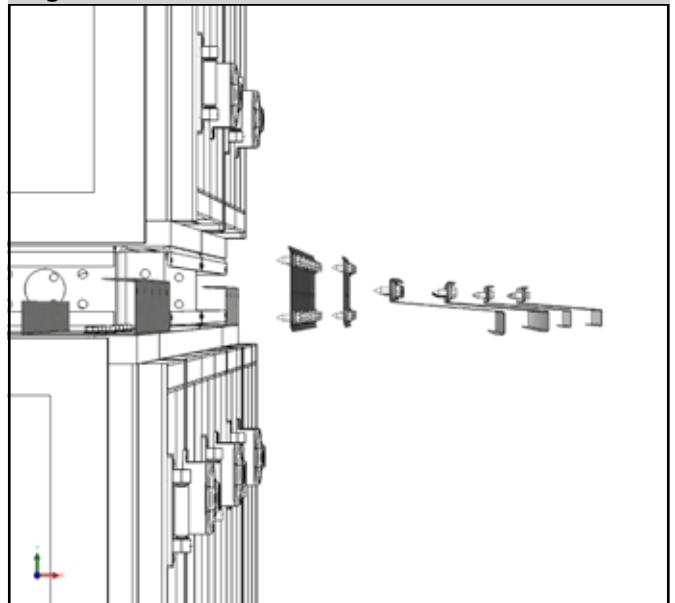


Figure 3



## Installation of Covering Roof

Figure 4

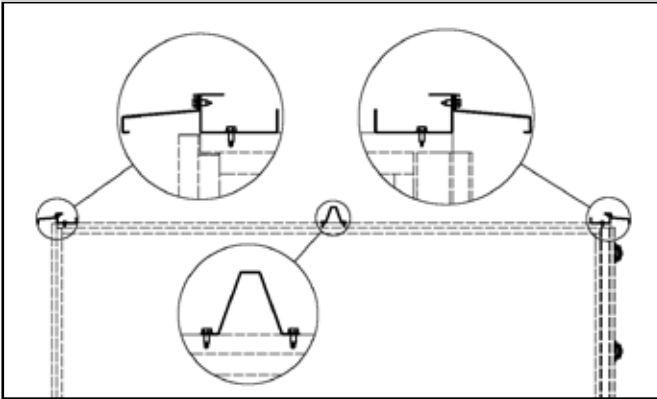
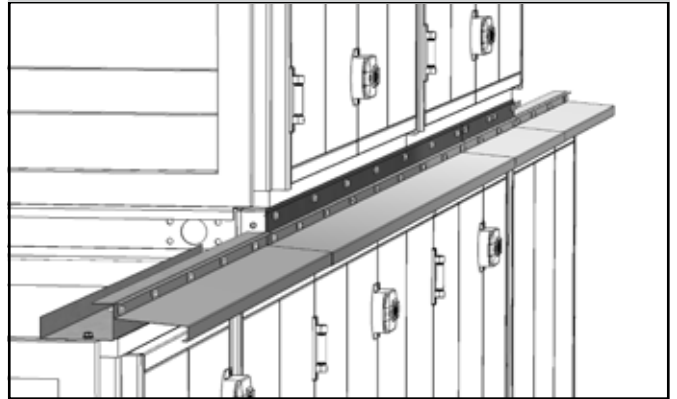


Figure 5



### Installation of Roof Segments (bending)

- For the roof segment installation sequence, refer to the figure.

Figure 6

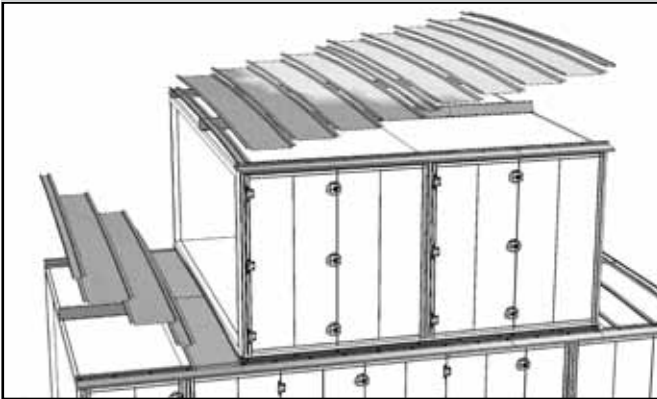
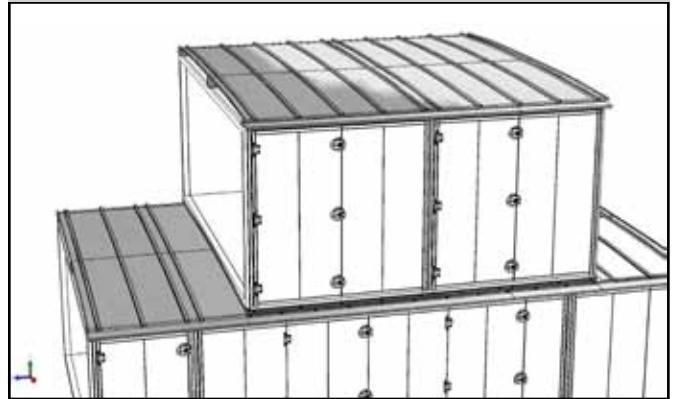


Figure 7



- The roof segmentation corresponds with the following:
  - a) module – modular length of the casing (module length = 306 mm)
  - b) termination - at the air-handling unit's front and end
  - c) transitions – block connection or vertical transition

Figure 8

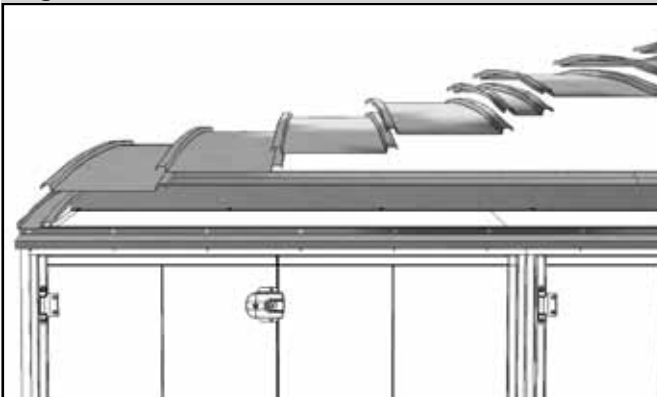
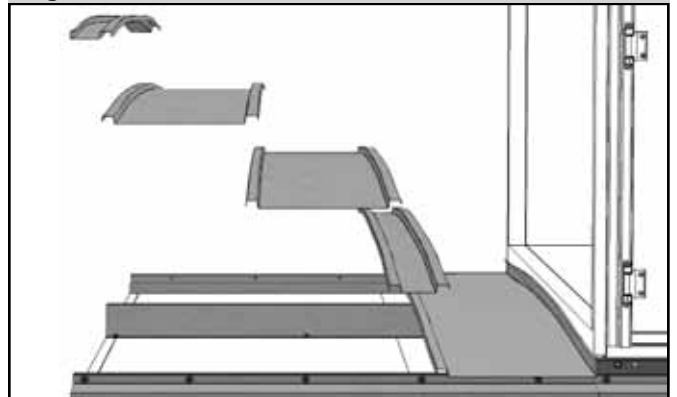


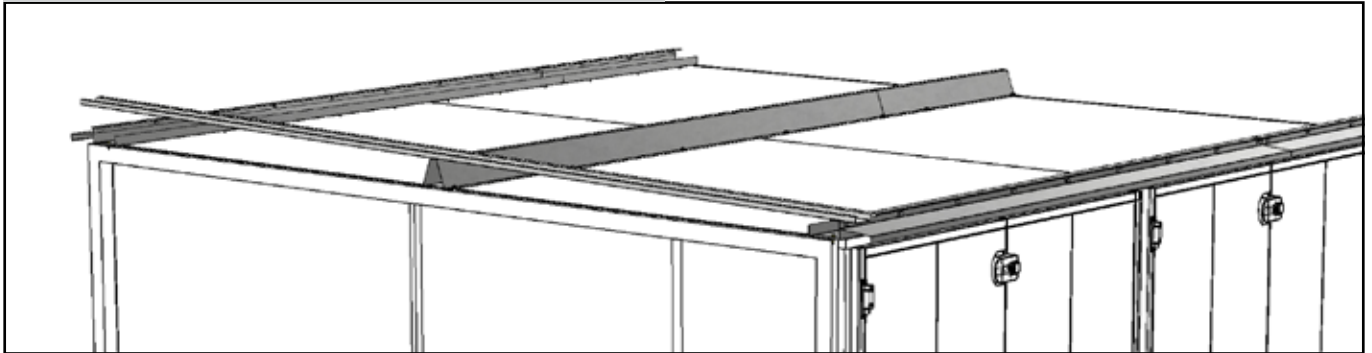
Figure 9



## Installation of Covering Roof

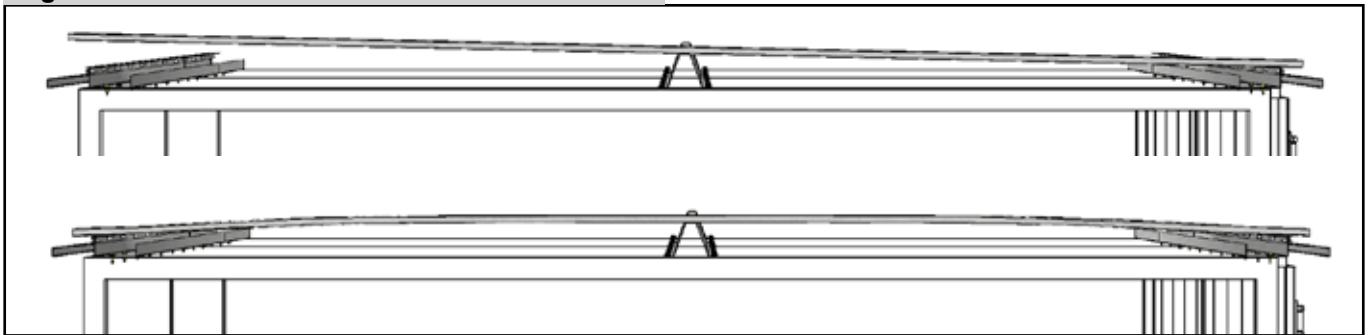
- Install the cross-members using  $6.5 \times 19\text{mm}$  roofing screws with rubber washers.
- Attach one side of the roof segments to the side roof girders and then in the centre to the central roof girder.

Figure 10



- Bending and attaching the other roof segment end creates the roof slope (bending) required for draining rainwater.

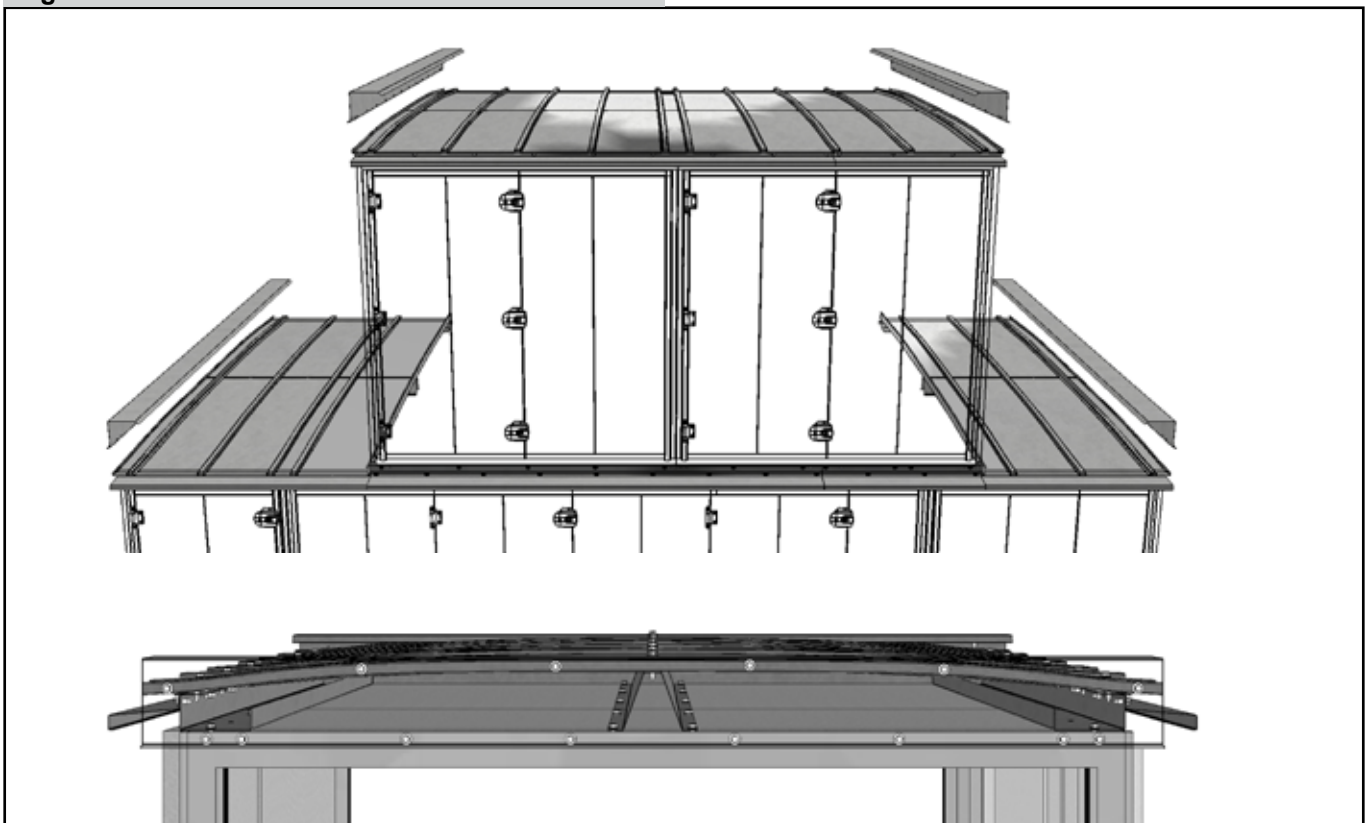
Figure 11



## Installation of Terminal Elements (closure ends)

- Install the ends using  $6.5 \times 19\text{ mm}$  roofing screws with rubber washers.

Figure 12

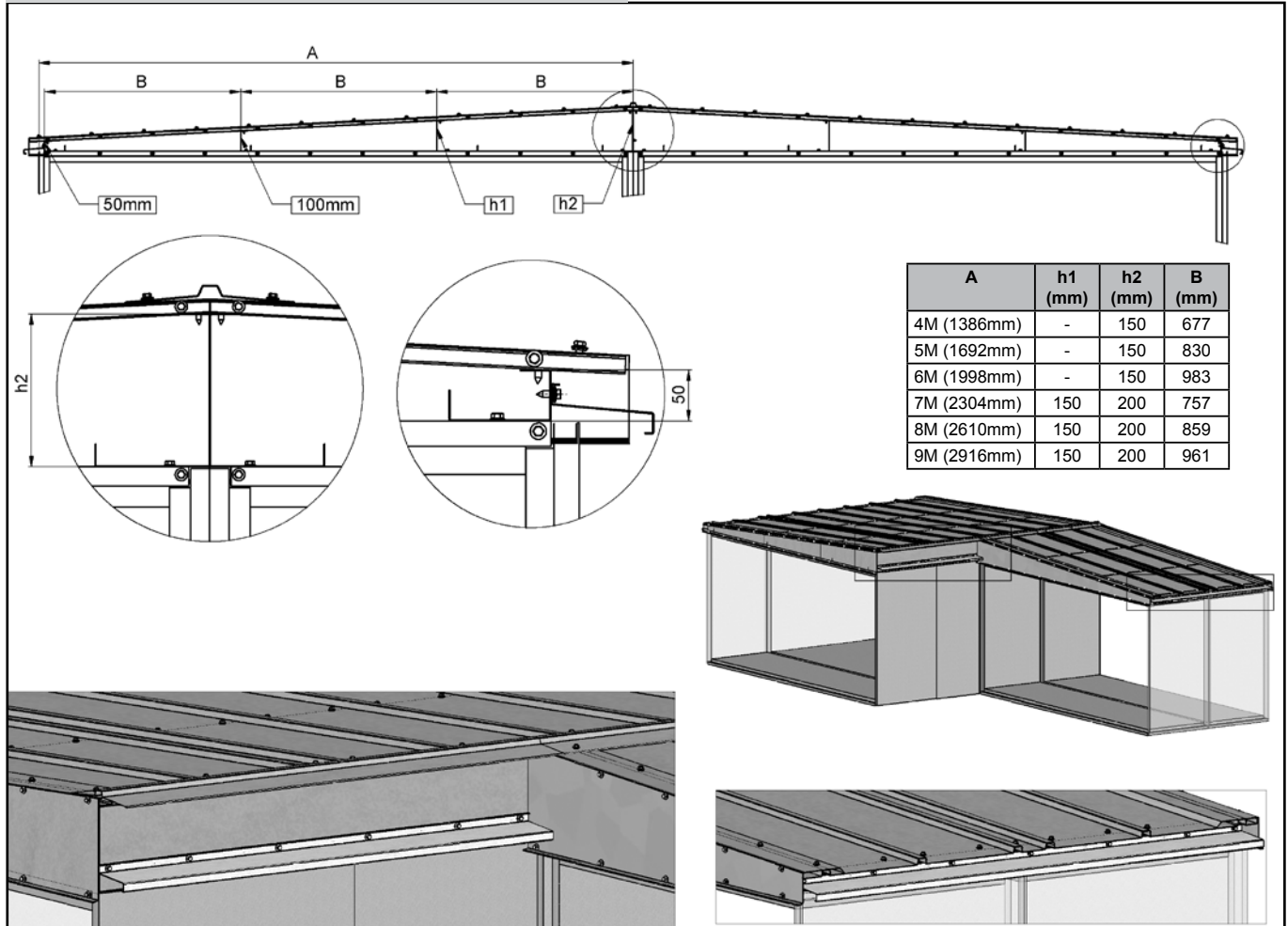


## Installation of Covering Roof

### Horizontally Arranged Units

- The roof slope for draining rainwater is created in the same way as with normal sloped roofs.
- The roof girders are combined according to the air-handling unit width and the required height (h1/h2) and spacing (B)

Figure 13



### Covers for Overlapping Components

- Install the covers using 6.5 × 19mm roofing screws with rubber washers.

Figure 14

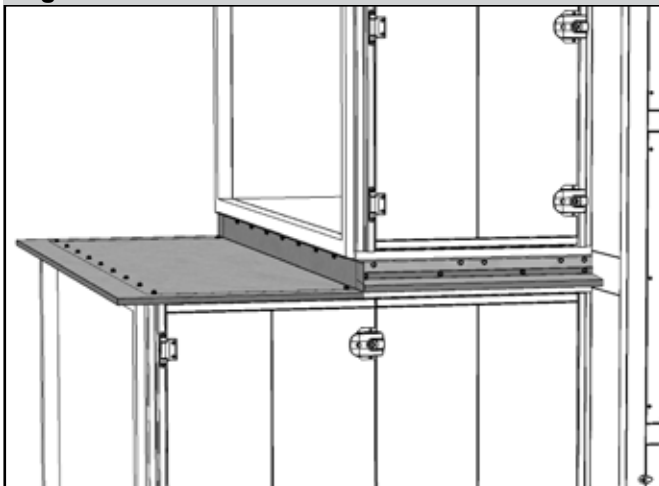
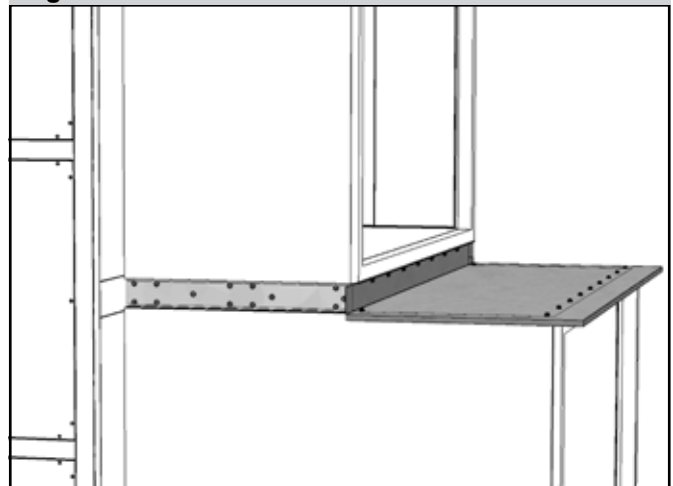


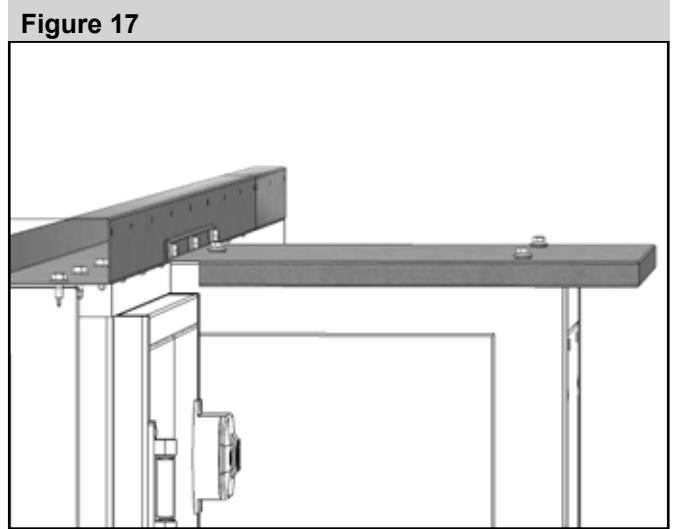
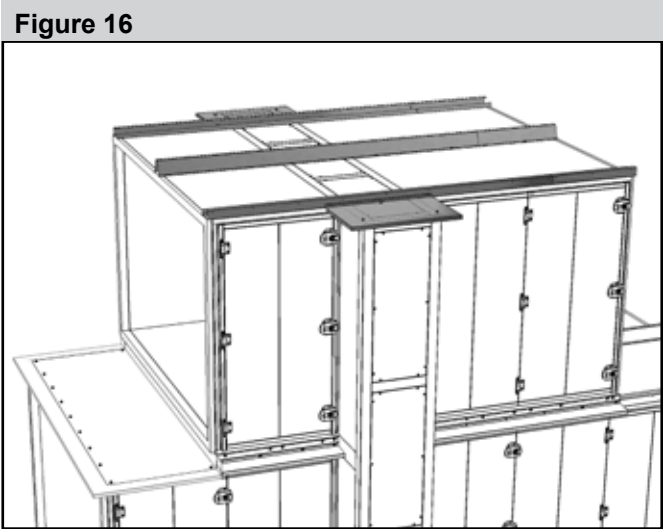
Figure 15





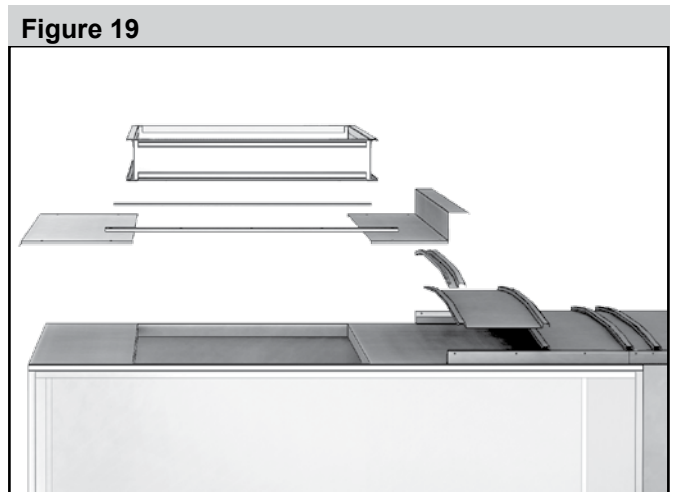
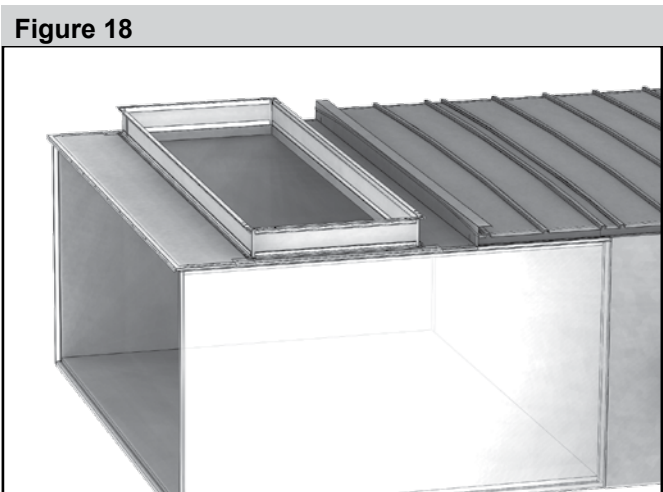
## Installation of Covering Roof

- a) lower block off-set – lower to upper block off-set of 1 to 2 modules.
- b) heat exchanger – the part protruding over the air-handling unit ground contour is covered by a flat roof.



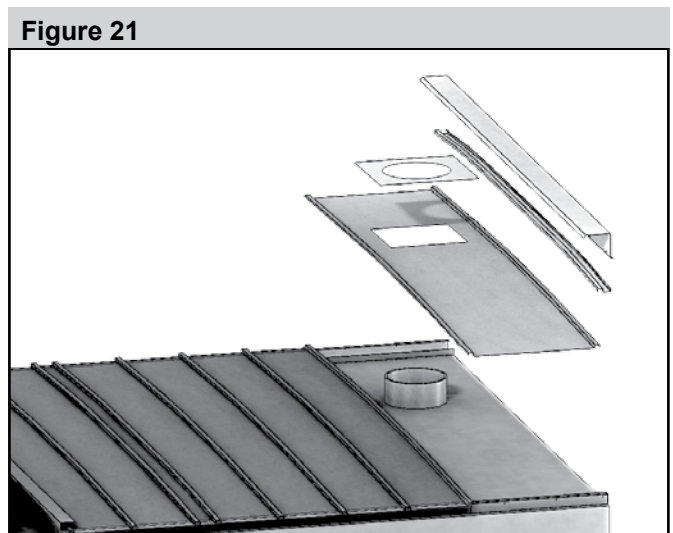
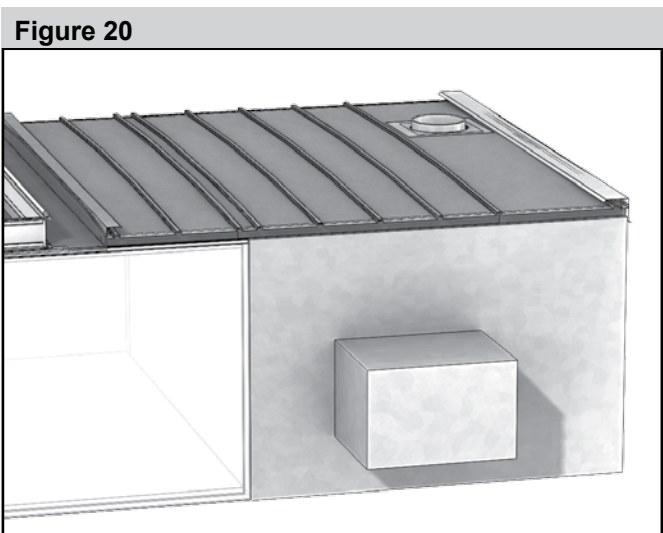
### Vertical Outlet

- The roof slope must be interrupted at the outlet opening..



### Gas Heating (chimney passage through the roof)

- For the flue-gas passage design, refer to figures 20 and 21.



## Installation of Covering Roof

### Rotary Heat Exchanger

- The rotary heat exchanger is higher than the air-handling unit, it will be covered with a flat roof.

Figure 22

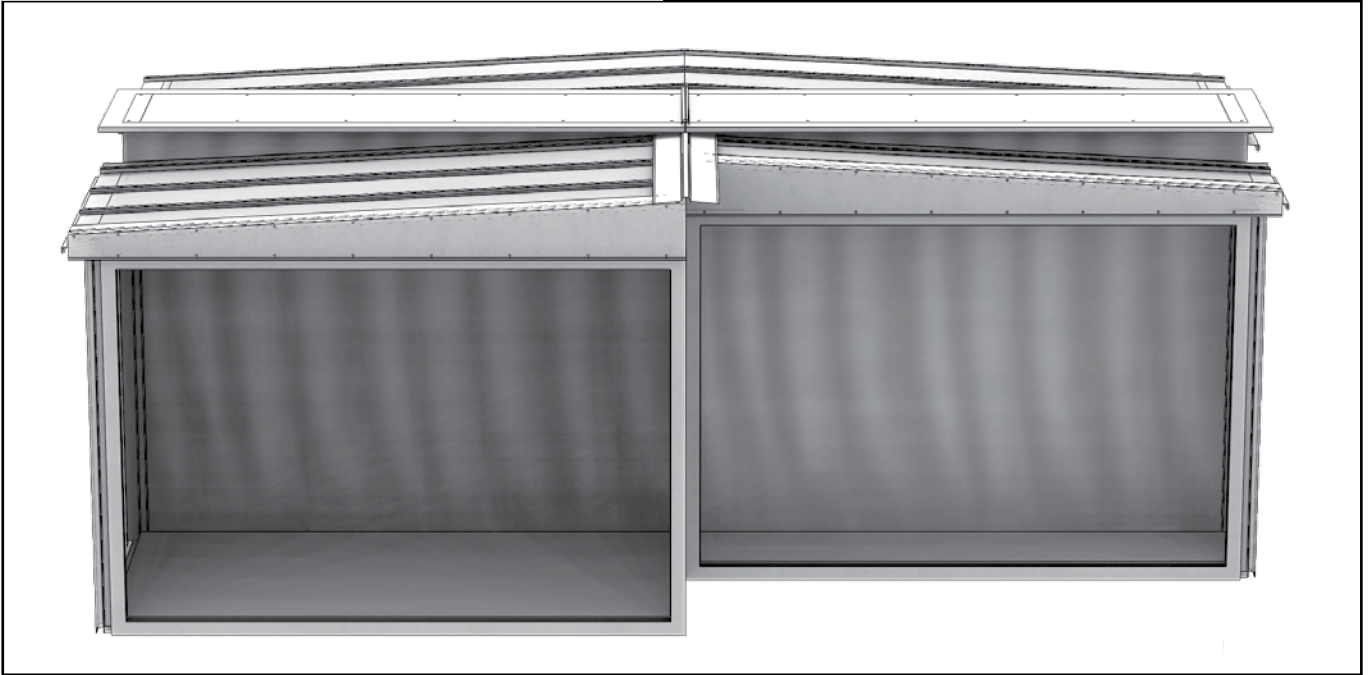
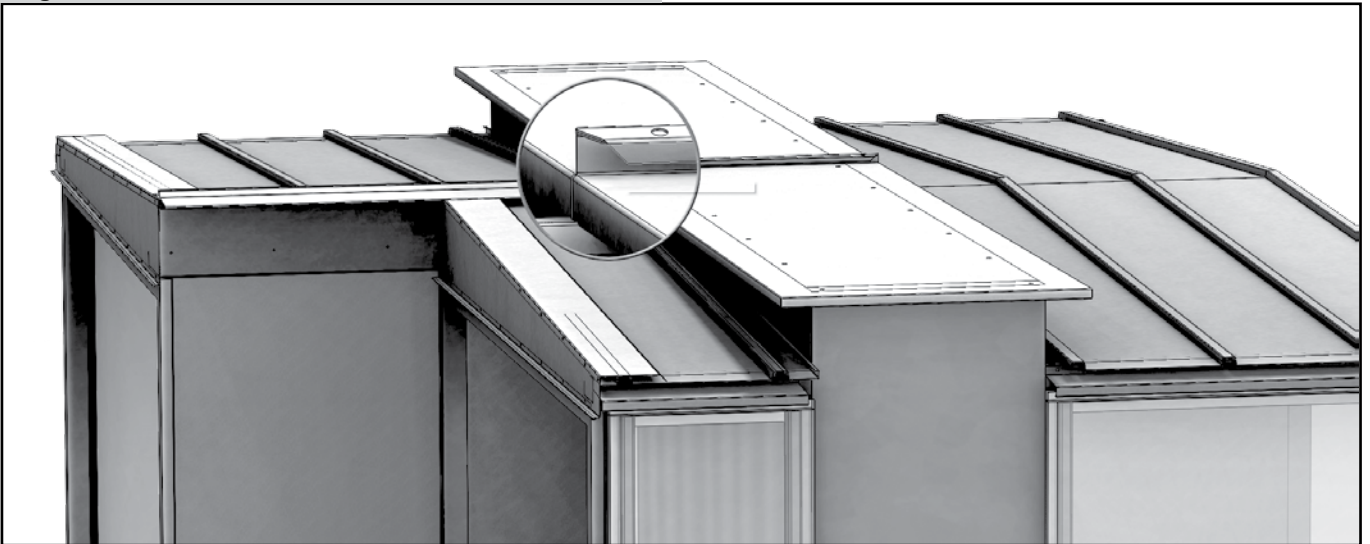


Figure 23



Check the integrity and secure attachment of all installed elements before finishing the installation. Every gap and leak must be sealed with silicone compound.

## Gas Heater Section (CRVBG)

### Section description

The casing of the section is made of aluminium frame sections and 50 mm thick thermally insulated panels.

The air is heated by flowing around the combustion chamber and its tube plate.

A flange for the burner mounting is situated on the front (service) side of the heat exchanger. The flue gases are drawn off via the chimney outlet (optionally on the rear side of the section). Sections are manufactured in two versions - either with or without the bypass. The bypass version is equipped with a damper to regulate air flow. Furthermore, the gas heater section is provided with a condensate drain outlet (1/2" pipe).

**Table 1** – included M&C components

Component	Place of installation	
Pt100 – flue-gas temperature sensor	to the flue-gas exhaust(-flue-gas duct)	it must be installed during device assembly
ESD3G – triple thermostat	gas heater section (behind the heat exchanger, following the airflow direction)	installed by the manufacturer
TH 167 – emergency thermostat	just preceding the gas heater section	it must be installed during device assembly
NS 120 – inlet air temperature sensor	behind the gas heater section, e.g. in the ducting 3 m behind XPTG section, to allow the air to be mixed	it must be installed during device assembly
NS 120 – flue-gas temperature sensor	behind the gas heater section, e.g. in the ducting 3 m behind XPTG section, to allow the air to be mixed	it must be installed during device assembly

This section can be delivered for indoor as well as for outdoor use. The burner and triple safety thermostat of the outdoor version are protected by covers.

A burner operated in an outdoor environment up to -20°C must be provided with a heating cable switched by the thermostat. As standard, this set is included in deliveries marked as TKW 53 for burners WG 10, WG 20, or as TKW 88 for burners WG 30, WG 40.

A burner operated in an outdoor environment from -20°C to -40°C must be equipped with a special heated cover of the burner and a burner flange for the external air inlet

### Burner closed heated cover installation

The external air inlet to the burner's extension is made from a Spyro hose. An aperture in the burner cover for the hose must be created in the appropriate location; the hose must be sealed in this aperture. Inlet air must come from the heated room.

The SK 3102.000 300W heating equipment will be attached on the heater panel under the burner valve block using a holder (enclosed, including 4 screws). Electrical connection will be made using a seven-pin connector at the burner. The heating power supply is ensured directly from the burner; therefore, the burner's "L" terminal must always be under voltage.

The thermostat of the burner cover is set to 5°C. If the cover's temperature drops below the pre-set temperature, the heating is switched on.

### Connection of Gas Heater

The XPTG gas heater section must be connected to the air duct via a dilatation insert heat resistant up to 200 °C. The gas-flue ducting must comply with all applicable directives and standards of the state of installation (for CZ - ČSN 73 4201 and ČSN 73 4210), and must be performed by a specialized provider. For information on installation, commissioning and inspections of the gas indirect heater and burner, refer to the special Installation and Operating Instructions which are included in the accompanying documentation of the air-handling unit.

Safety and control elements delivered with the section must be connected to ensure proper, reliable and safe operation.

### Gas Heater Section Start-Up

The gas heater is a special gas device which is characterized by a special activation procedure (commissioning). After completing the air-handling unit installation, it is necessary to place a separate order for the gas burner activation with the gas heater manufacturer or their representative. In addition to the gas burner adjustment, the interconnection of safety thermostats and the control circuits of the gas burner and air-handling unit (fans) must be checked during the gas heater commissioning. A commissioning report, which also includes settings of the gas heater temperatures and the results of testing of emergency and safety components, must be drawn up upon putting the gas heater into operation.

Separate documentation from the combustion chamber manufacturer is delivered with this section.

**Never start up the gas heater section if the air-handling unit is stopped, otherwise the hazard of local overheating of the air-handling unit will occur, which can damage some components (e.g. drop eliminator).**

## Gas Heater Section (CRVBG)

Figure 1 – Burner heated cover dimensions

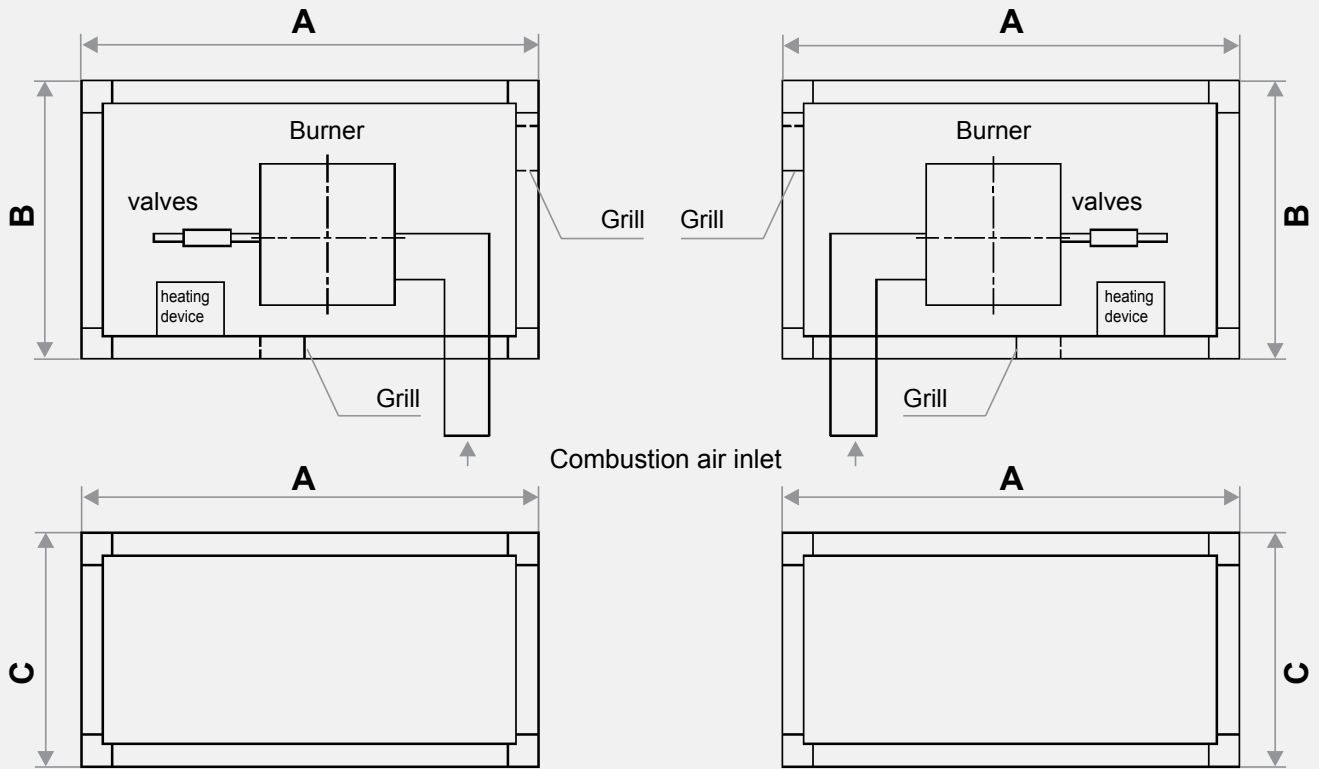


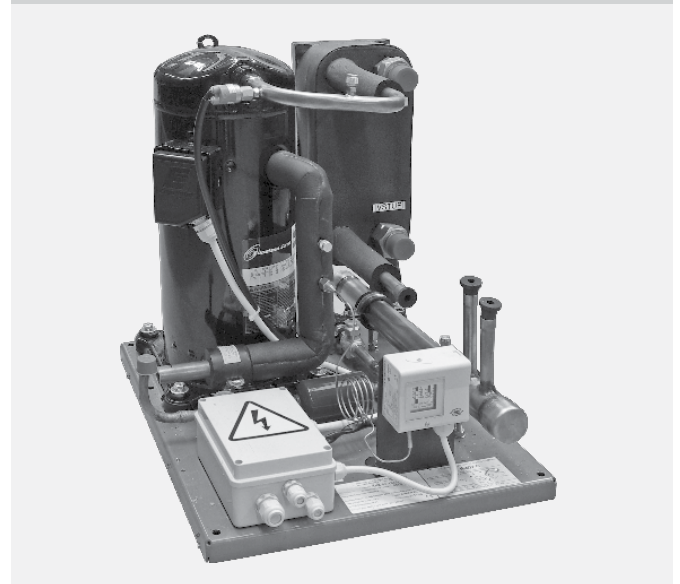
Table 2 – Burner heated cover dimensions and weights

Burner type	A [mm]	B [mm]	C [mm]	Weight [kg]
WG 10 and WG 20	1020	620	520	cca 50
WG 30 and WG 40	1590	790	820	cca 110
G5	1590	790	1000	cca 125

## Integrated Cooling Section

Separate documentation is delivered with this section. This documentation is available to download from our website: [www.remak.eu](http://www.remak.eu)

Figure 1 – Integrated Cooler Section





## Supplementary information - Pool design of units, 2nd Generation

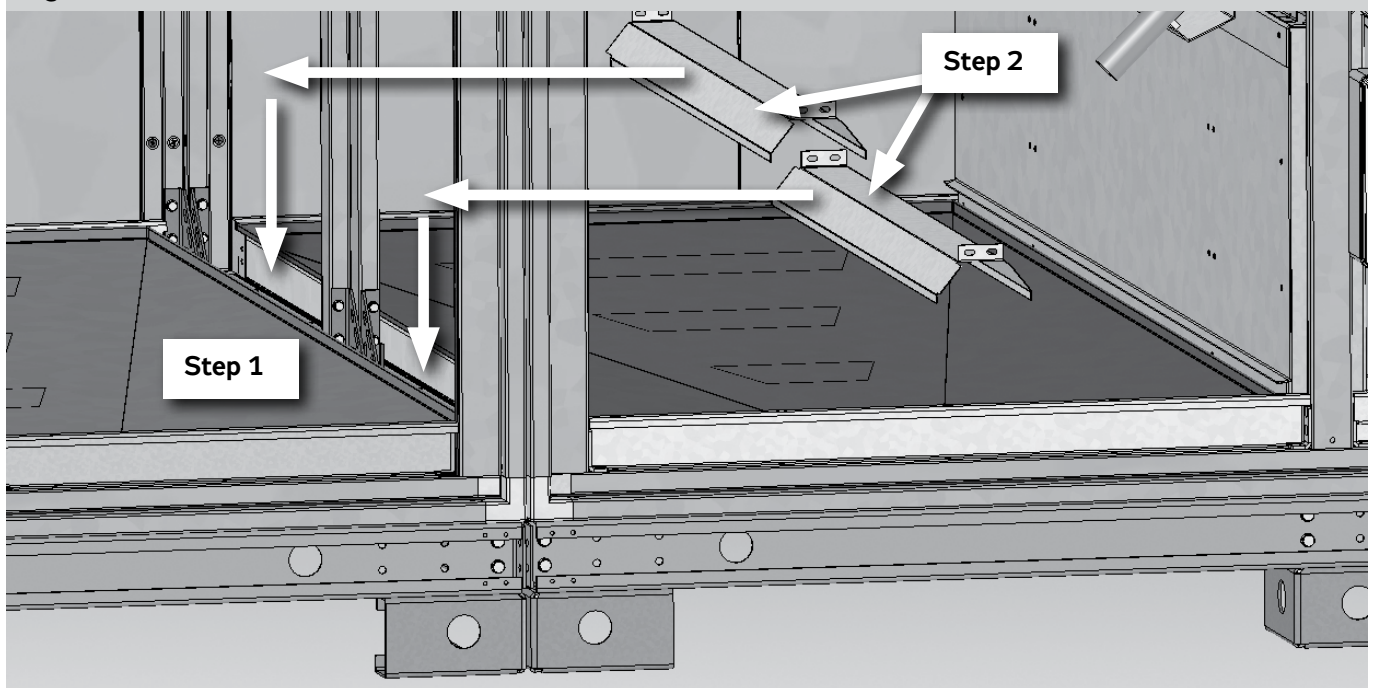
### Surface finish – corrosion protection

During transport, handling and operation it is necessary to pay increased attention to damage of finishes. Preserving the integrity of the surface is a prerequisite for durability. Any damage to the surface has to be corrected without delay from its findings. Repairs carried out:

- 1x HEMPATANE TOPCOAT 55210 (two component gloss acrylic polyurethane topcoat), CURING AGENT 95370.
- Volume mix ratio of 7:1 (base 55219: hardener 95370).
- RAL 3020 tint
- HEMPEL'S 08510 thinner

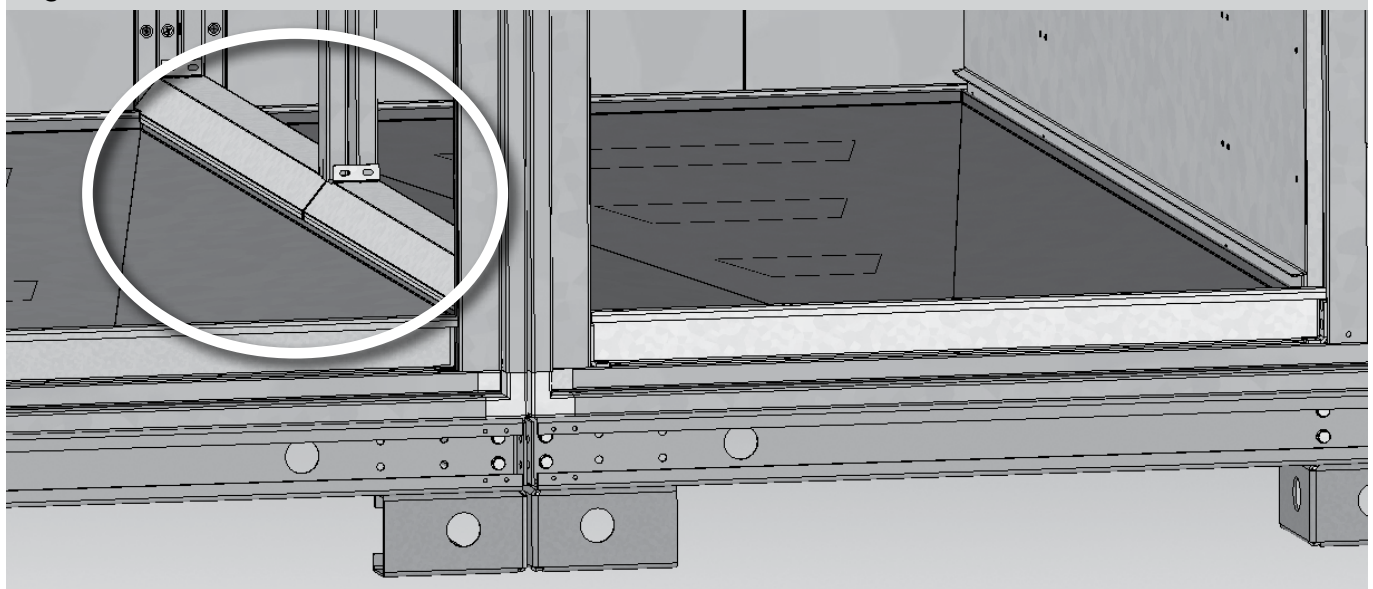
- SECTIONS CONNECTING AND COVERING THE TUBS
- **Step 1:** sections connecting in the standard way at the corners and in the center.
- **Step 2:** covering the tubs with sheet metal parts

Figure 1



- After assembly, apply the silicone grease against leakage of condensate out of the tub.

Figure 2



## Supplementary information - Pool design of units, 2nd Generation

### Connecting sections – Fan assembly

Figure 3

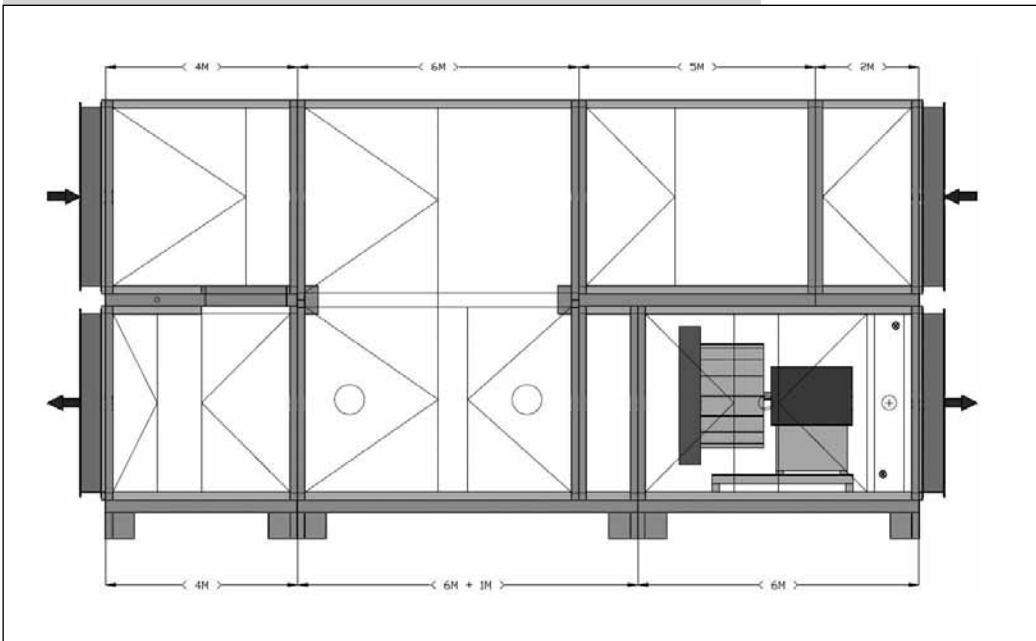
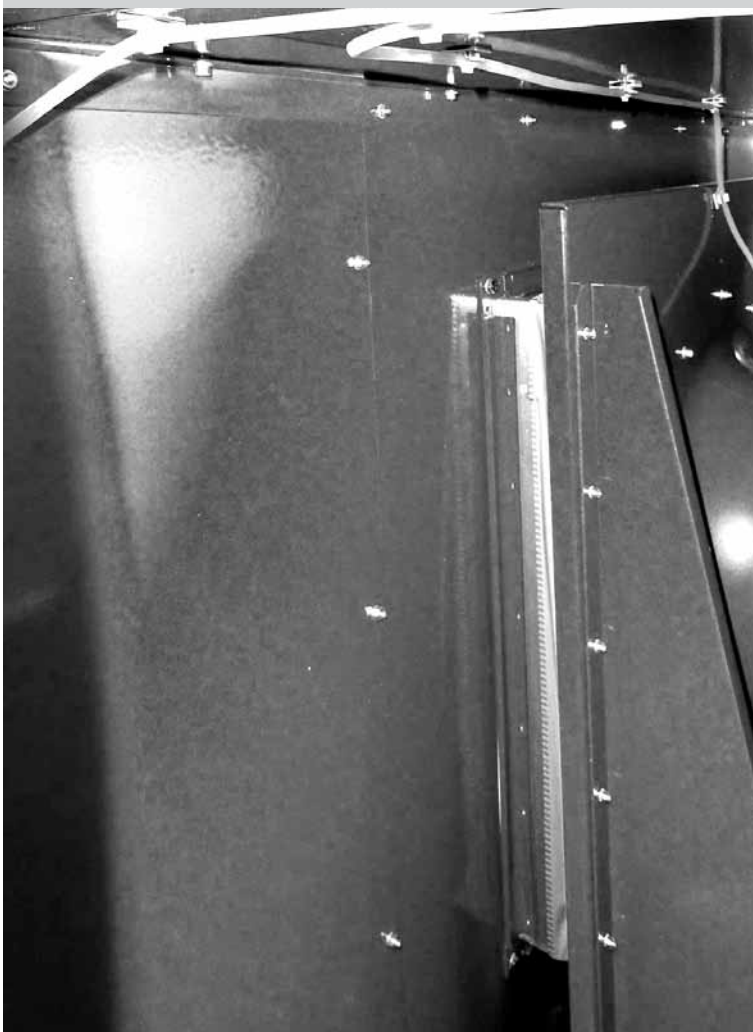


Figure 4



- **Step 1:**  
loosen the screws of the fan damper.
- **Step 2:**  
loosen the screws of the fan dividing plate.
- **Step 3:**  
eject the fan dividing plate.

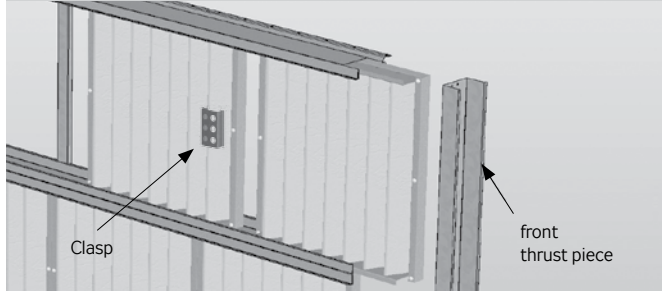
## Replacement of fabrics inside of insert filter

### Replacement procedure

Filter inserts of the frame and insert (G3) filters are inserted into the rails. The individual inserts are mutually fixed with a clasp to be removed all at once.

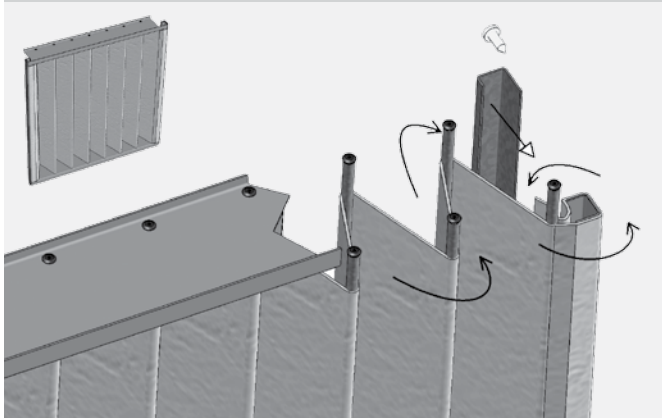
- **Step 1:** Remove front thrust piece off the filtration wall.

Figure 1



- **Step 2:** Remove clogged fabrics from the metal filter structure.

Figure 2



### Repalcment procedure

Vložky filtrů rámečkových a vložkových (G3) se zasouvají do kolejnic. Jednotlivé vložky jsou vzájemně sepnuty sponou tak, aby se vysouvaly všechny najednou.

- **Step č. 1:** Odstraňte přední přitlačný díl z filtrační stěny.



Always observe local laws and regulations.

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*Issued: 26th May, 2015*

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